



REPLY TO  
ATTENTION OF

DEPARTMENT OF THE ARMY  
NEW YORK DISTRICT, CORPS OF ENGINEERS  
JACOB K. JAVITS FEDERAL BUILDING  
NEW YORK, N.Y. 10278-0090

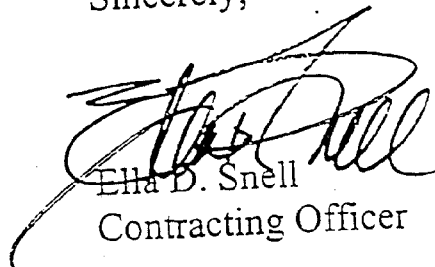
Contracts Branch  
Contracting Division

SUBJECT: Central Contractor Registration

TO ALL PROSPECTIVE CONTRACTORS:

Please be advised that it is now required to register with the CCR (Central Contractor Registration) in order to perform work for the Federal Government. For additional information, please refer to the instruction sheet on the back of this letter, which includes the appropriate websites and telephone numbers.

Sincerely,



Ella D. Snell  
Contracting Officer

## CENTRAL CONTRACTOR REGISTRATION

***HTTP://WWW.ACQ.OSD.MIL/EC***

**1(800) 334-3414**

The Central Contractor Registry (CCR) is the Government's new national storing house of commercial and financial information on current and would-be contractors.

CCR eliminates the requirement for current and future contractors to submit Standard Form 129 and provides a single location for registering to conduct business with the Federal Government. Access to the register is available via the World Wide Web. A registration workbook is available for downloading from this site. It is highly recommended you review it prior to processing CCR to ensure all required information is available. Contractors are required to have a DUNS (Data Universal Numbering System) assigned by Dunn & Bradstreet at no charge (call 1-800-333-0505).

The initial Web Site application capability is for the initial contractor registration only. The ability to change, update or cancel a registration and query contractor information via the Web is currently in effect. After submitting a registration, contractors may use the Web application to inquire as to the status of their registration. Typically, a registration will be activated within 48 hours after receiving a complete and accurate application via the Internet. To register via the Internet, go to <http://ccr.edi.disa.mil>. Registration of an applicant through fax or mail may take up to 30 days. The mailing addresses are as follows: For firms with Legal business names beginning with the letters A-K or a number use CCR Registration Assistance Center, 2000 South Loop 256, Suite 11, Palestine, Texas 75801, FAX NO: (903) 729-7988. For firms with Legal business names beginning with the letters L-Z or a number use CCR Registration Assistance Center, 1450 Scalp Avenue, Johnstown, PA. 15904 FAX NO: (814) 262-2326. For those Contractor's who chose to register by mail, a paper registration form can be used and sent or faxed to the appropriate above address who will also furnish the form. Once successfully registered in CCR, a notice will be sent via email, fax, or regular post with information that a Trading Partner Identification Number (TPIN) will soon follow. For CCR implementation and contract questions please contact Robert Cooper at (703) 681-7573.

Anyone may access CCR via the Web to inquire whether vendor is registered at the following site: <http://ccr.edi.disa.mil>.

Information or assistance is available from your local Electronic Commerce Resources Center or Electronic Commerce Information Center at 1-800-334-3414 (8am-8pm), Monday-Friday, except Federal Holidays.

Additionally, your local Procurement Technical Assistance Center (PTAC) employs highly skilled professionals to help businesses like ours earn Federal and State Government contracts; assist with your CCR enrollment. The PTAC can provide Government specifications, daily listings of bid opportunities, bid history and contract award results, training and assistance with Electronic Data Exchange (EDI).

To find the office nearest you, the national PTAC directory can be accessed at Website <http://www.fedmarket.com/tecassis.html>.



**US Army Corps  
of Engineers®**  
NEW YORK DISTRICT

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**GREEN BROOK SUB-BASIN OF THE RARITAN  
RIVER**

**GREEN BROOK FLOOD CONTROL PROJECT  
SEGMENT U**

**BOROUGH OF BOUND BROOK  
NEW JERSEY**

<p><b>Specifications</b></p>
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**IFB NO. DACW 51-03-B-0019**

**(This Project is A Small Business Set-Aside)**

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US ARMY ENGINEER DISTRICT, NEW YORK

**INVITATION FOR BID NO. DACW51-03-B-0019**

CHECK LIST FOR BIDDERS

ATTACHED IS IFB NO. DACW51-03-B-0019

Green Brook Sub-Basin of the Raritan River, Green Brook Flood Control Project,  
Segment U, Borough of Bound Brook, New Jersey

ALL INFORMATION REQUIRED BY THE TERMS OF THIS SOLICITATION MUST BE FURNISHED. MISTAKES OR OMISSIONS MAY RENDER YOUR BID INELIGIBLE FOR AWARD. IMPORTANT ITEMS FOR YOU TO CHECK ARE INCLUDED IN BUT NOT LIMITED TO THOSE LISTED BELOW. THIS INFORMATION IS FURNISHED ONLY TO ASSIST YOU IN SUBMITTING A PROPER BID.

☐ HAVE YOU ACKNOWLEDGED ALL AMENDMENTS?

☐ HAVE YOU COMPLETED THE "REPRESENTATIONS AND CERTIFICATIONS" (SECTION 00600) PORTION OF THE SOLICITATION?

☐ IS YOUR DUNS NUMBER LISTED ON THE STANDARD FORM 1442?

☐ IS YOUR BID PROPERLY SIGNED?

☐ A BID BOND IS REQUIRED. HAS YOUR SURETY PROVIDED YOU WITH A BID BOND ON STANDARD FORM 24 OR A SIMILAR FORM CONTAINING THE SAME LANGUAGE AS A STANDARD FORM 24?

☐ IS YOUR BID GUARANTEE IN THE PROPER AMOUNT?

☐ IS YOUR BID GUARANTEE PROPERLY SIGNED BY BOTH THE BIDDER AND SURETY AND ARE ALL REQUIRED SEALS AFFIXED?

☐ IS THE NAME IN WHICH YOU SUBMITTED THE BID THE SAME ON YOUR BID AS ON THE BID BOND?

☐ IS YOUR BID BOND INCLUDED WITH YOUR BID? (A LATE BID GUARANTEE IS TREATED THE SAME AS A LATE BID)

☐ HAVE YOU ENSURED THAT YOU HAVE NOT RESTRICTED YOUR BID BY ALTERING THE PROVISIONS OF THE SOLICITATION?

\_\_\_ WHEN REQUIRED, HAVE YOU ENTERED A UNIT PRICE FOR EACH BID ITEM? (THE SOLICITATION SPECIFICALLY STATES WHEN THIS IS NECESSARY.)

\_\_\_ ARE DECIMALS IN YOUR PRICES IN THE PROPER PLACE? ARE YOUR FIGURES LEGIBLE?

\_\_\_ IF YOU HAVE MADE ERASURES OR CORRECTIONS ON YOUR BID, ARE THEY INITIALED BY THE PERSON SIGNING THE BID?

\_\_\_ DOES THE ENVELOPE CONTAINING YOUR BID PROPERLY IDENTIFY THAT IT IS A SEALED BID AND DOES IT CONTAIN THE CORRECT SOLICITATION NUMBER AND BID OPENING TIME?

\_\_\_ WILL YOUR BID ARRIVE ON TIME? (SEE PARAGRAPH ENTITLED "LATE SUBMISSIONS, MODIFICATIONS, AND WITHDRAWALS OF BIDS" IN THE INSTRUCTIONS, CONDITIONS, AND NOTICES TO BIDDERS, SECTION 00100 OF THE SOLICITATION.)

**NOTE:** THERE ARE INCREASED SECURITY MEASURES AT JACOB K. JAVITS FEDERAL BUILDING, 26 FEDERAL PLAZA THAT MAY AFFECT THE TIME IT TAKES TO ENTER THE BUILDING. BIDDERS IS RESPONSIBLE TO ENSURE THAT ITS BID IS SUBMITTED TIMELY.

IFB NO. DACW51-03-B-0019

NEW YORK DISTRICT  
CORPS OF ENGINEERS  
NEW YORK, NEW YORK 10278-0090

INVITATION FOR BIDS  
FOR  
Green Brook Sub-Basin of the Raritan River, Green Brook Flood Control Project,  
Segment U,  
Boroughs of Bound Brook, New Jersey

1. Attached is INVITATION FOR BIDS (IFB) NO. DACW51-03-B-0019.
2. BIDS MUST BE SET FORTH full, accurate, and complete information as required by this Invitation for Bids, including attachments. The penalty for making false statements in bids is prescribed under Title 18, United States Code, Section 1001.
3. SUBMISSION OF BIDS: Complete details concerning proper submission of bids are contained in the INSTRUCTIONS, CONDITIONS, AND NOTICES TO BIDDERS (Section 00100).
4. Note the REQUIREMENT FOR AFFIRMATIVE ACTION of the EQUAL OPPORTUNITY clause as it applies to the contract resulting from this solicitation. (See paragraph NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY in Section 00100 of this IFB).
5. REPRESENTATIONS AND CERTIFICATIONS – SECTION 00600  
Bidders and Offerors are required to complete the REPRESENTATIONS AND CERTIFICATIONS and submit them with their bids.

Within Section 00600, note in particular the CERTIFICATION OF NONSEGREGATED FACILITIES. Failure of a bidder or offeror to agree to the certification will render his bid or offer non-responsive to the terms of solicitations involving awards of contracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause (1984 APR).

6. THIS IS A CIVIL WORKS PROGRAM PROCUREMENT AND IS NOT FUNDED BY THE DEPARTMENT OF DEFENSE. BUY AMERICAN ACT – CONSTRUCTION MATERIALS (MAY 1993) IN ACCORDANCE WITH FAR 52.225-5 APPLIES.

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Segment U  
Borough of Bound Brook, New Jersey

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00700	CONTRACT CLAUSES
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<b>SOLICITATION, OFFER, AND AWARD</b> <i>(Construction, Alteration, or Repair)</i>	1. SOLICITATION NO. DACW51-03-B-0019	2. TYPE OF SOLICITATION <input checked="checked" type="checkbox"/> SEALED BID (IFB) <input type="checkbox"/> NEGOTIATED (RFP)	3. DATE ISSUED 22-Aug-2003	PAGE OF PAGES 1 OF 91
<b>IMPORTANT - The "offer" section on the reverse must be fully completed by offeror.</b>				
4. CONTRACT NO.	5. REQUISITION/PURCHASE REQUEST NO. W16ROE-3203-8775		6. PROJECT NO.	
7. ISSUED BY CODE USA ENGINEER DISTRICT, NEW YORK ATTN: CENAN-CT ROOM 1843 26 FEDERAL PLAZA (DACW51) NEW YORK NY 10278-0090  TEL: FAX: (212)264-3013		8. ADDRESS OFFER TO <i>(If Other Than Item 7) CODE</i> USA ENGINEER DISTRICT, NEW YORK ATTN: CENAN-CT, ROOM 1843, 26 FEDERAL PLA NEW YORK NY 10278-0090  TEL: 212-264-9069 FAX: 212-264-3013		
9. FOR INFORMATION CALL:	A. NAME NORMA J SMITH		B. TELEPHONE NO. <i>(Include area code) (NO COLLECT CALLS)</i> 212-264-0242	
<b>SOLICITATION</b>				
<b>NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder".</b>				
10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS <i>(Title, identifying no., date):</i>  Green Brook Flood Control Project, Segment U, Borough of Bound Brook, NJ.  This project is unrestricted.  NAICS Code : 237990, size standard \$28.5 Million  Contract Specialist: Norma J. Smith, (212) 264-0242 Technical Manager: Walter Scott, (212) 264-9080  This is a civil works funded action under the continuing contracts clause.  All work shall be in accordance with the drawings and specifications or instructions attached within.  PLEASE REVIEW ALL BONDS AND ACCOMPANYING DOCUMENTS REQUIRED TO BE SUBMITTED. Bonds, Powers of Attorney, statement of authenticity and continuing validity, and all related documents MUST NOT bear computer printer generated signatures and/or seals. Documents bearing signatures and/or seals generated as part of a document, as opposed to being affixed to the document after its generation, will not be accepted. Submission of such documents may render the bid or offer non-responsive and ineligible for award.				
11. The Contractor shall begin performance within <u>5</u> calendar days and complete it within <u>210</u> calendar days after receiving <input type="checkbox"/> award, <input checked="checked" type="checkbox"/> notice to proceed. This performance period is <input checked="checked" type="checkbox"/> mandatory, <input type="checkbox"/> negotiable. <i>(See _____.)</i>				
12 A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS? <i>(If "YES," indicate within how many calendar days after award in Item 12B.)</i> <input checked="checked" type="checkbox"/> YES <input type="checkbox"/> NO			12B. CALENDAR DAYS  10	
13. ADDITIONAL SOLICITATION REQUIREMENTS:  A. Sealed offers in original and <u>1</u> copies to perform the work required are due at the place specified in Item 8 by <u>01:30 AM</u> <i>(hour)</i> local time <u>24 Sep 2003</u> <i>(date)</i> . If this is a sealed bid solicitation, offers must be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.  B. An offer guarantee <input checked="checked" type="checkbox"/> is, <input type="checkbox"/> is not required.  C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.  D. Offers providing less than <u>90</u> calendar days for Government acceptance after the date offers are due will not be considered and will be rejected.				

**SOLICITATION, OFFER, AND AWARD (Continued)***(Construction, Alteration, or Repair)***OFFER (Must be fully completed by offeror)**

14. NAME AND ADDRESS OF OFFEROR <i>(Include ZIP Code)</i>		15. TELEPHONE NO. <i>(Include area code)</i>
		16. REMITTANCE ADDRESS <i>(Include only if different than Item 14)</i>  <b>See Item 14</b>
CODE	FACILITY CODE	

17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government in writing within \_\_\_\_\_ calendar days after the date offers are due. *(Insert any number equal to or greater than the minimum requirements stated in Item 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.)*

AMOUNTS	SEE SCHEDULE OF PRICES
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18. The offeror agrees to furnish any required performance and payment bonds.

**19. ACKNOWLEDGMENT OF AMENDMENTS***(The offeror acknowledges receipt of amendments to the solicitation -- give number and date of each)*

AMENDMENT NO.										
DATE										

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER <i>(Type or print)</i>	20B. SIGNATURE	20C. OFFER DATE
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**AWARD (To be completed by Government)**

21. ITEMS ACCEPTED:

22. AMOUNT	23. ACCOUNTING AND APPROPRIATION DATA
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24. SUBMIT INVOICES TO ADDRESS SHOWN IN <i>(4 copies unless otherwise specified)</i>	ITEM	25. OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO <input type="checkbox"/> 10 U.S.C. 2304(c) <input type="checkbox"/> 41 U.S.C. 253(c)
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26. ADMINISTERED BY CODE	27. PAYMENT WILL BE MADE BY: CODE
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**CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE**

<input type="checkbox"/> 28. NEGOTIATED AGREEMENT <i>(Contractor is required to sign this document and return _____ copies to issuing office.)</i> Contractor agrees to furnish and deliver all items or perform all work, requisitions identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications or incorporated by reference in or attached to this contract.	<input type="checkbox"/> 29. AWARD <i>(Contractor is not required to sign this document.)</i> Your offer on this solicitation, is hereby accepted as to the items listed. This award consummates the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary.
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30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN <i>(Type or print)</i>		31A. NAME OF CONTRACTING OFFICER <i>(Type or print)</i>	
30B. SIGNATURE	30C. DATE	TEL: EMAIL:	
		31B. UNITED STATES OF AMERICA BY	31C. AWARD DATE

## Section 00010 - Solicitation Contract Form

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001		1	Lump Sum		

All work for the construction of the Segment U levee/floodwall from Route 28,  
proceeding north across the Shoprite Shopping Plaza to Route 22  
PURCHASE REQUEST NUMBER: W16ROE-3203-8775

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NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002 OPTION		1	Lump Sum		

FFP  
Commercial General/ Public Liability Insurance, not less than \$5,000,000 (See section  
00800 paragraph 39 for details).

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NET AMT

FOB: Destination

TOTAL BASE BID

**TOTAL BASE BID FOR LINE ITEM 0001**

\$ \_\_\_\_\_

**TOTAL BASE BID PLUS OPTION LINE ITEM 0001-0002**

\$ \_\_\_\_\_

## Section 00100 - Bidding Schedule/Instructions to Bidders

## CLAUSES INCORPORATED BY REFERENCE

52.204-6	Data Universal Numbering System (DUNS) Number	JUN 1999
52.214-3	Amendments To Invitations For Bids	DEC 1989
52.214-5	Submission Of Bids	MAR 1997
52.214-6	Explanation To Prospective Bidders	APR 1984
52.214-7	Late Submissions, Modifications, and Withdrawals of Bids	NOV 1999
52.214-10	Contract Award--Sealed Bidding	JUL 1990
52.214-12	Preparation Of Bids	APR 1984
52.214-18	Preparation of Bids-Construction	APR 1984
52.214-19	Contract Award-Sealed Bidding-Construction	AUG 1996
52.214-34	Submission Of Offers In The English Language	APR 1991
52.214-35	Submission Of Offers In U.S. Currency	APR 1991
52.222-38	Compliance with Veterans' Employment Reporting Requirements	DEC 2001
52.225-9	Buy American Act--Construction Materials	MAY 2002
52.225-10	Notice of Buy American Act Requirement--Construction Materials	MAY 2002
52.232-15	Progress Payments Not Included	APR 1984
52.232-38	Submission of Electronic Funds Transfer Information with Offer	MAY 1999

## CLAUSES INCORPORATED BY FULL TEXT

## 52.214-4 FALSE STATEMENTS IN BIDS (APR 1984)

Bidders must provide full, accurate, and complete information as required by this solicitation and its attachments. The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

(End of provision)

## 52.214-15 PERIOD FOR ACCEPTANCE OF BIDS (APR 1984)

In compliance with the solicitation, the bidder agrees, if this bid is accepted within 30calendar from the date specified in the solicitation for receipt of bids, to furnish any or all items upon which prices are bid at the price set opposite each item, delivered at the designated point(s), within the time specified in the Schedule.

(End of clause)

## 52.216-1 TYPE OF CONTRACT (APR 1984)

The Government contemplates award of a FFP Construction contract resulting from this solicitation.

(End of clause)

## 52.233-2 SERVICE OF PROTEST (AUG 1996)

(a) Protests, as defined in section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from Chief, Contracting Division, 26 Federal Plaza, New York, NY 10278-0090.

(b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

(End of provision)

## 52.236-27 SITE VISIT (CONSTRUCTION) (FEB 1995)

(a) The clauses at 52.236-2, Differing Site Conditions, and 52.236-3, Site Investigations and Conditions Affecting the Work, will be included in any contract awarded as a result of this solicitation. Accordingly, offerors or quoters are urged and expected to inspect the site where the work will be performed.

(b) Site visits may be arranged during normal duty hours by contacting:

Name: Walter Scott

Address: US Army Corps of Engineers, New York District, 26 Federal Plaza, New York, NY 10278-0090

Telephone: 212 264-9080

(End of provision)

## 52.252-1 SOLICITATION PROVISIONS INCORPORATED BY REFERENCE (FEB 1998)

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. The offeror is cautioned that the listed provisions may include blocks that must be completed by the offeror and submitted with its quotation or offer. In lieu of submitting the full text of those provisions, the offeror may identify the provision by paragraph identifier and provide the appropriate information with its quotation or offer. Also, the full text of a solicitation provision may be accessed electronically at this/these address(es):

[www.arnet.gov/far](http://www.arnet.gov/far)  
<http://farsite.hill.af.mil>  
<http://www.dtic.mil/dfars>

[(End of provision

Section 00600 - Representations & Certifications

CLAUSES INCORPORATED BY REFERENCE

252.247-7022 Representation Of Extent Of Transportation Of Supplies By Sea AUG 1992

CLAUSES INCORPORATED BY FULL TEXT

52.203-2 CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (APR 1985)

(a) The offeror certifies that --

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to --

(i) Those prices,

(ii) The intention to submit an offer, or

(iii) The methods of factors used to calculate the prices offered:

(2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory --

(1) Is the person in the offeror's organization responsible for determining the prices offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision \_\_\_\_\_ (insert full name of person(s) in the offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror's organization);

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision.

(c) If the offeror deletes or modifies subparagraph (a)(2) of this provision, the offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

(End of clause)

52.203-11 CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (APR 1991)

(a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this Certification.

(b) The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after December 23, 1989,--

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan, or cooperative agreement;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the offeror shall complete and submit, with its offer, OMB standard form LLL, Disclosure of Lobbying Activities, to the Contracting Officer; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of \$100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision, shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000, for each such failure.

(End of provision)

52.209-5 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS (DEC 2001)

(a)(1) The Offeror certifies, to the best of its knowledge and belief, that--

(i) The Offeror and/or any of its Principals --

(A) Are ( ) are not ( ) presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) Have ( ) have not ( ), within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and

(C) Are ( ) are not ( ) presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in subdivision (a)(1)(i)(B) of this provision.



(ii) The Offeror has ( ) has not ( ), within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER SECTION 1001, TITLE 18, UNITED STATES CODE.

(b) The Offeror shall provide immediate written notice to the Contracting Officer if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror nonresponsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting Officer may terminate the contract resulting from this solicitation for default.

(End of provision)

#### 52.214-14 PLACE OF PERFORMANCE--SEALED BIDDING (APR 1985)

(a) The bidder, in the performance of any contract resulting from this solicitation, [ ] intends, [ ] does not intend [check applicable box] to use one or more plants or facilities located at a different address from the address of the bidder as indicated in this bid.

(b) If the bidder checks "intends" in paragraph (a) above, it shall insert in the spaces provided below the required information:

Place of Performance    Name and Address of Owner  
(Street, Address, City, and Operator of the Plant or  
County, State, Zip Code) Facility if Other than Bidder

_____	_____
_____	_____
_____	_____
_____	_____

(End of provision)

#### 52.219-1 SMALL BUSINESS PROGRAM REPRESENTATIONS (APR 2002)

(a)(1) The North American Industry Classification System (NAICS) code for this acquisition is 237990.

(2) The small business size standard is \$28.5 Million .

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

(b) Representations. (1) The offeror represents as part of its offer that it ( ) is, ( ) is not a small business concern.

(2) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents, for general statistical purposes, that it ( ) is, ( ) is not a small disadvantaged business concern as defined in 13 CFR 124.1002.

(3) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents as part of its offer that it ( ) is, ( ) is not a women-owned small business concern.

(4) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents as part of its offer that it ( ) is, ( ) is not a veteran-owned small business concern.

(5) (Complete only if the offeror represented itself as a veteran-owned small business concern in paragraph (b)(4) of this provision.) The offeror represents as part of its offer that it ( ) is, ( ) is not a service-disabled veteran-owned small business concern.

(6) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents, as part of its offer, that--

(i) It ( ) is, ( ) is not a HUBZone small business concern listed, on the date of this representation, on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration, and no material change in ownership and control, principal office, or HUBZone employee percentage has occurred since it was certified by the Small Business Administration in accordance with 13 CFR part 126; and

(ii) It ( ) is, ( ) is not a joint venture that complies with the requirements of 13 CFR part 126, and the representation in paragraph (b)(6)(i) of this provision is accurate for the HUBZone small business concern or concerns that are participating in the joint venture. (The offeror shall enter the name or names of the HUBZone small business concern or concerns that are participating in the joint venture:\_\_\_\_\_.) Each HUBZone small business concern participating in the joint venture shall submit a separate signed copy of the HUBZone representation.

(c) Definitions. As used in this provision--

Service-disabled veteran-owned small business concern--

(1) Means a small business concern--

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

"Small business concern," means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and the size standard in paragraph (a) of this provision.

Veteran-owned small business concern means a small business concern--

(1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

"Women-owned small business concern," means a small business concern --

(1) That is at least 51 percent owned by one or more women; in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

(d) Notice.

(1) If this solicitation is for supplies and has been set aside, in whole or in part, for small business concerns, then the clause in this solicitation providing notice of the set-aside contains restrictions on the source of the end items to be furnished.

(2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small, HUBZone small, small disadvantaged, or women-owned small business concern in order to obtain a contract to be awarded under the preference programs established pursuant to section 8(a), 8(d), 9, or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall--

(i) Be punished by imposition of fine, imprisonment, or both;

(ii) Be subject to administrative remedies, including suspension and debarment; and

(iii) Be ineligible for participation in programs conducted under the authority of the Act.

(End of provision)

## 52.219-2 EQUAL LOW BIDS. (OCT 1995)

(a) This provision applies to small business concerns only.

(b) The bidder's status as a labor surplus area (LSA) concern may affect entitlement to award in case of tie bids. If the bidder wishes to be considered for this priority, the bidder must identify, in the following space, the LSA in which the costs to be incurred on account of manufacturing or production (by the bidder or the first-tier subcontractors) amount to more than 50 percent of the contract price.

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(c) Failure to identify the labor surplus area as specified in paragraph (b) of this provision will preclude the bidder from receiving priority consideration. If the bidder is awarded a contract as a result of receiving priority consideration under this provision and would not have otherwise received award, the bidder shall perform the contract or cause the contract to be performed in accordance with the obligations of an LSA concern.

#### 52.222-22 PREVIOUS CONTRACTS AND COMPLIANCE REPORTS (FEB 1999)

The offeror represents that --

(a) ☐ It has, ☐ has not participated in a previous contract or subcontract subject to the Equal Opportunity clause of this solicitation;

(b) ☐ It has, ☐ has not, filed all required compliance reports; and

(c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

(End of provision)

#### 52.223-13 CERTIFICATION OF TOXIC CHEMICAL RELEASE REPORTING (OCT 2000)

(a) Submission of this certification is a prerequisite for making or entering into this contract imposed by Executive Order 12969, August 8, 1995.

(b) By signing this offer, the offeror certifies that--

(1) As the owner or operator of facilities that will be used in the performance of this contract that are subject to the filing and reporting requirements described in section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023) and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106), the offeror will file and continue to file for such facilities for the life of the contract the Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of EPCRA and section 6607 of PPA; or

(2) None of its owned or operated facilities to be used in the performance of this contract is subject to the Form R filing and reporting requirements because each such facility is exempt for at least one of the following reasons: (Check each block that is applicable.)

☐ (i) The facility does not manufacture, process or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C. 11023(c);

☐ (ii) The facility does not have 10 or more full-time employees as specified in section 313.(b)(1)(A) of EPCRA 42 U.S.C. 11023(b)(1)(A);

☐ (iii) The facility does not meet the reporting thresholds of toxic chemicals established under section 313(f) of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

( ) (iv) The facility does not fall within Standard Industrial Classification Code (SIC) major groups 20 through 39 or their corresponding North American Industry Classification System (NAICS) sectors 31 through 33; or

( ) (v) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.

(End of clause)

252.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A TERRORIST COUNTRY (MAR 1998)

(a) "Definitions."

As used in this provision --

(a) "Government of a terrorist country" includes the state and the government of a terrorist country, as well as any political subdivision, agency, or instrumentality thereof.

(2) "Terrorist country" means a country determined by the Secretary of State, under section 6(j)(1)(A) of the Export Administration Act of 1979 (50 U.S.C. App. 2405(j)(i)(A)), to be a country the government of which has repeatedly provided support for such acts of international terrorism. As of the date of this provision, terrorist countries include: Cuba, Iran, Iraq, Libya, North Korea, Sudan, and Syria.

(3) "Significant interest" means --

(i) Ownership of or beneficial interest in 5 percent or more of the firm's or subsidiary's securities. Beneficial interest includes holding 5 percent or more of any class of the firm's securities in "nominee shares," "street names," or some other method of holding securities that does not disclose the beneficial owner;

(ii) Holding a management position in the firm, such as a director or officer;

(iii) Ability to control or influence the election, appointment, or tenure of directors or officers in the firm;

(iv) Ownership of 10 percent or more of the assets of a firm such as equipment, buildings, real estate, or other tangible assets of the firm; or

(v) Holding 50 percent or more of the indebtedness of a firm.

(b) "Prohibition on award."

In accordance with 10 U.S.C. 2327, no contract may be awarded to a firm or a subsidiary of a firm if the government of a terrorist country has a significant interest in the firm or subsidiary or, in the case of a subsidiary, the firm that owns the subsidiary, unless a waiver is granted by the Secretary of Defense.

(c) "Disclosure."

If the government of a terrorist country has a significant interest in the Offeror or a subsidiary of the Offeror, the Offeror shall disclose such interest in an attachment to its offer. If the Offeror is a subsidiary, it shall also disclose any significant interest the government of a terrorist country has in any firm that owns or controls the subsidiary. The disclosure shall include --

(1) Identification of each government holding a significant interest; and

(2) A description of the significant interest held by each government.

(End of provision)

252.227-7028 TECHNICAL DATA OR COMPUTER SOFTWARE PREVIOUSLY DELIVERED TO THE GOVERNMENT  
(JUN 1995)

The Offeror shall attach to its offer an identification of all documents or other media incorporating technical data or computer software it intends to deliver under this contract with other than unlimited rights that are identical or substantially similar to documents or other media that the Offeror has produced for, delivered to, or is obligated to deliver to the Government under any contract or subcontract. The attachment shall identify--

(a) The contract number under which the data or software were produced;

(b) The contract number under which, and the name and address of the organization to whom, the data or software were most recently delivered or will be delivered; and

(c) Any limitations on the Government's rights to use or disclose the data or software, including, when applicable, identification of the earliest date the limitations expire.

(End of clause)

## Section 00700 - Contract Clauses

## CLAUSES INCORPORATED BY REFERENCE

52.202-1	Definitions	DEC 2001
52.203-3	Gratuities	APR 1984
52.203-5	Covenant Against Contingent Fees	APR 1984
52.203-6	Restrictions On Subcontractor Sales To The Government	JUL 1995
52.203-7	Anti-Kickback Procedures	JUL 1995
52.203-8	Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity	JAN 1997
52.203-10	Price Or Fee Adjustment For Illegal Or Improper Activity	JAN 1997
52.203-12	Limitation On Payments To Influence Certain Federal Transactions	JUN 1997
52.204-4	Printed or Copied Double-Sided on Recycled Paper	AUG 2000
52.209-6	Protecting the Government's Interest When Subcontracting With Contractors Debarred, Suspended, or Proposed for Debarment	JUL 1995
52.211-18	Variation in Estimated Quantity	APR 1984
52.214-26	Audit and Records--Sealed Bidding	OCT 1997
52.214-27	Price Reduction for Defective Cost or Pricing Data - Modifications - Sealed Bidding	OCT 1997
52.214-28	Subcontracting Cost Or Pricing Data--Modifications--Sealed Bidding	OCT 1997
52.214-29	Order Of Precedence--Sealed Bidding	JAN 1986
52.217-4	Evaluation Of Options Exercised At The Time Of Contract Award	JUN 1988
52.219-8	Utilization of Small Business Concerns	OCT 2000
52.219-9	Small Business Subcontracting Plan	JAN 2002
52.219-14	Limitations On Subcontracting	DEC 1996
52.219-16	Liquidated Damages-Subcontracting Plan	JAN 1999
52.219-22	Small Disadvantaged Business Status	OCT 1999
52.222-3	Convict Labor	AUG 1996
52.222-4	Contract Work Hours and Safety Standards Act - Overtime Compensation	SEP 2000
52.222-6	Davis Bacon Act	FEB 1995
52.222-7	Withholding of Funds	FEB 1988
52.222-8	Payrolls and Basic Records	FEB 1988
52.222-9	Apprentices and Trainees	FEB 1988
52.222-10	Compliance with Copeland Act Requirements	FEB 1988
52.222-11	Subcontracts (Labor Standards)	FEB 1988
52.222-12	Contract Termination-Debarment	FEB 1988
52.222-13	Compliance with Davis -Bacon and Related Act Regulations.	FEB 1988
52.222-14	Disputes Concerning Labor Standards	FEB 1988
52.222-15	Certification of Eligibility	FEB 1988
52.222-21	Prohibition Of Segregated Facilities	FEB 1999
52.222-26	Equal Opportunity	APR 2002
52.222-27	Affirmative Action Compliance Requirements for Construction	FEB 1999
52.222-35	Equal Opportunity For Special Disabled Veterans, Veterans of the Vietnam Era and Other Eligible Veterans	DEC 2001
52.222-36	Affirmative Action For Workers With Disabilities	JUN 1998

52.222-37	Employment Reports On Special Disabled Veterans, Veterans Of The Vietnam Era and Other Eligible Veterans	DEC 2001
52.222-38	Compliance with Veterans' Employment Reporting Requirements	DEC 2001
52.223-6	Drug Free Workplace	MAY 2001
52.223-13	Certification of Toxic Chemical Release Reporting	OCT 2000
52.223-14	Toxic Chemical Release Reporting	OCT 2000
52.225-9	Buy American Act--Construction Materials	MAY 2002
52.225-13	Restrictions on Certain Foreign Purchases	JUL 2000
52.226-1	Utilization Of Indian Organizations And Indian-Owned Economic Enterprises	JUN 2000
52.227-1	Authorization and Consent	JUL 1995
52.227-2	Notice And Assistance Regarding Patent And Copyright Infringement	AUG 1996
52.227-4	Patent Indemnity-Construction Contracts	APR 1984
52.228-1	Bid Guarantee	SEP 1996
52.228-11	Pledges Of Assets	FEB 1992
52.228-14	Irrevocable Letter of Credit	DEC 1999
52.228-15	Performance and Payment Bonds--Construction	JUL 2000
52.229-3	Federal, State And Local Taxes	JAN 1991
52.232-5	Payments under Fixed-Price Construction Contracts	MAY 1997
52.232-27	Prompt Payment for Construction Contracts	FEB 2002
52.232-33	Payment by Electronic Funds Transfer--Central Contractor Registration	MAY 1999
52.233-1	Disputes	JUL 2002
52.233-3	Protest After Award	AUG 1996
52.236-2	Differing Site Conditions	APR 1984
52.236-3	Site Investigation and Conditions Affecting the Work	APR 1984
52.236-5	Material and Workmanship	APR 1984
52.236-6	Superintendence by the Contractor	APR 1984
52.236-7	Permits and Responsibilities	NOV 1991
52.236-8	Other Contracts	APR 1984
52.236-9	Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements	APR 1984
52.236-10	Operations and Storage Areas	APR 1984
52.236-11	Use and Possession Prior to Completion	APR 1984
52.236-12	Cleaning Up	APR 1984
52.236-13	Accident Prevention	NOV 1991
52.236-15	Schedules for Construction Contracts	APR 1984
52.236-17	Layout of Work	APR 1984
52.236-21	Specifications and Drawings for Construction	FEB 1997
52.236-26	Preconstruction Conference	FEB 1995
52.242-13	Bankruptcy	JUL 1995
52.242-14	Suspension of Work	APR 1984
52.243-4	Changes	AUG 1987
52.246-12	Inspection of Construction	AUG 1996
52.246-21	Warranty of Construction	MAR 1994
52.249-2	Termination For Convenience Of The Government (Fixed-Price)	SEP 1996
52.249-10	Default (Fixed-Price Construction)	APR 1984
52.253-1	Computer Generated Forms	JAN 1991
252.201-7000	Contracting Officer's Representative	DEC 1991



252.203-7001	Prohibition On Persons Convicted of Fraud or Other Defense- Contract-Related Felonies	MAR 1999
252.204-7003	Control Of Government Personnel Work Product	APR 1992
252.204-7004	Required Central Contractor Registration	NOV 2001
252.205-7000	Provisions Of Information To Cooperative Agreement Holders	DEC 1991
252.209-7000	Acquisition From Subcontractors Subject To On-Site Inspection Under The Intermediate Range Nuclear Forces (INF) Treaty	NOV 1995
252.209-7004	Subcontracting With Firms That Are Owned or Controlled By The Government of a Terrorist Country	MAR 1998
252.219-7004	Small, Small Disadvantaged Women-Owned Business Subcontracting Plan (Test Program)	JUN 1997
252.223-7004	Drug Free Work Force	SEP 1988
252.225-7012	Preference For Certain Domestic Commodities	APR 2002
252.225-7031	Secondary Arab Boycott Of Israel	JUN 1992
252.226-7001	Utilization of Indian Organizations and Indian-Owned Economic Enterprises-DoD Contracts	SEP 2001
252.227-7033	Rights in Shop Drawings	APR 1966
252.236-7000	Modification Proposals -Price Breakdown	DEC 1991
252.236-7001	Contract Drawings, Maps, and Specifications	AUG 2000
252.236-7002	Obstruction of Navigable Waterways	DEC 1991
252.236-7008	Contract Prices-Bidding Schedules	DEC 1991
252.242-7000	Postaward Conference	DEC 1991
252.243-7001	Pricing Of Contract Modifications	DEC 1991
252.243-7002	Requests for Equitable Adjustment	MAR 1998
252.246-7000	Material Inspection And Receiving Report	DEC 1991
252.247-7023	Transportation of Supplies by Sea	MAY 2002
252.247-7024	Notification Of Transportation Of Supplies By Sea	MAR 2000

#### CLAUSES INCORPORATED BY FULL TEXT

##### 52.204-1 APPROVAL OF CONTRACT (DEC 1989)

This contract is subject to the written approval of **the contracting officer** and shall not be binding until so approved.

(End of clause)

##### 52.211-10 COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK (APR 1984)

The Contractor shall be required to (a) commence work under this contract within 5 calendar days after the date the Contractor receives the notice to proceed, (b) prosecute the work diligently, and (c) complete the entire work ready for use not later than 210 calendar days. The time stated for completion shall include final cleanup of the premises.

\*The Contracting Officer shall specify either a number of days after the date the contractor receives the notice to proceed, or a calendar date.

(End of clause)

## 52.211-12 LIQUIDATED DAMAGES--CONSTRUCTION (SEP 2000)

(a) If the Contractor fails to complete the work within the time specified in the contract, the Contractor shall pay liquidated damages to the Government in the amount of \$ 900 [Contracting Officer insert amount] for each calendar day of delay until the work is completed or accepted.

(b) If the Government terminates the Contractor's right to proceed, liquidated damages will continue to accrue until the work is completed. These liquidated damages are in addition to excess costs of repurchase under the Termination clause.

(End of clause)

## 52.222-23 NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY FOR CONSTRUCTION (FEB 1999)

(a) The offeror's attention is called to the Equal Opportunity clause and the Affirmative Action Compliance Requirements for Construction clause of this solicitation.

(b) The goals for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for minority participation for each trade	Goals for female participation for each trade
17.3%	6.9%

These goals are applicable to all the Contractor's construction work performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, the Contractor shall apply the goals established for the geographical area where the work is actually performed. Goals are published periodically in the Federal Register in notice form, and these notices may be obtained from any Office of Federal Contract Compliance Programs office.

(c) The Contractor's compliance with Executive Order 11246, as amended, and the regulations in 41 CFR 60-4 shall be based on (1) its implementation of the Equal Opportunity clause, (2) specific affirmative action obligations required by the clause entitled "Affirmative Action Compliance Requirements for Construction," and (3) its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade. The Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor, or from project to project, for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, Executive Order 11246, as amended, and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

(d) The Contractor shall provide written notification to the Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, within 10 working days following award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the --

(1) Name, address, and telephone number of the subcontractor;

(2) Employer's identification number of the subcontractor;

- (3) Estimated dollar amount of the subcontract;
- (4) Estimated starting and completion dates of the subcontract; and
- (5) Geographical area in which the subcontract is to be performed.

(e) As used in this Notice, and in any contract resulting from this solicitation, the "covered area" is New Jersey, Middlesex, and Bound Brook.  
(End of provision)

#### 52.232-16 PROGRESS PAYMENTS (FEB 2002)

The Government will make progress payments to the Contractor when requested as work progresses, but not more frequently than monthly, in amounts of \$2,500 or more approved by the Contracting Officer, under the following conditions:

(a) Computation of amounts. (1) Unless the Contractor requests a smaller amount, the Government will compute each progress payment as 80 percent of the Contractor's total costs incurred under this contract whether or not actually paid, plus financing payments to subcontractors (see paragraph (j) of this clause), less the sum of all previous progress payments made by the Government under this contract. The Contracting Officer will consider cost of money that would be allowable under FAR 31.205-10 as an incurred cost for progress payment purposes.

(2) The amount of financing and other payments for supplies and services purchased directly for the contract are limited to the amounts that have been paid by cash, check, or other forms of payment, or that will be paid to subcontractors--

(i) In accordance with the terms and conditions of a subcontract or invoice; and

(ii) Ordinarily prior to the submission of the Contractor's next payment request to the Government.

(3) The Government will exclude accrued costs of Contractor contributions under employee pension plans until actually paid unless--

(i) The Contractor's practice is to make contributions to the retirement fund quarterly or more frequently; and

(ii) The contribution does not remain unpaid 30 days after the end of the applicable quarter or shorter payment period (any contribution remaining unpaid shall be excluded from the Contractor's total costs for progress payments until paid).

(4) The Contractor shall not include the following in total costs for progress payment purposes in subparagraph (a)(1)(i) above:

(i) Costs that are not reasonable, allocable to this contract, and consistent with sound and generally accepted accounting principles and practices.

(ii) Costs incurred by subcontractors or suppliers.

(iii) Costs ordinarily capitalized and subject to depreciation or amortization except for the properly depreciated or amortized portion of such costs.

(iv) Payments made or amounts payable to subcontractors or suppliers, except for --

(A) Completed work, including partial deliveries, to which the Contractor has acquired title; and

(B) Work under cost-reimbursement or time-and-material subcontracts to which the Contractor has acquired title.

(5) The Contractor shall not include the following in total costs for progress payment purposes in paragraph (a)(1) of this clause:

(i) the progress payments made against incomplete work (including allowable unliquidated progress payments to subcontractors) nor

(ii) the value, for progress payment purposes, of the incomplete work. Incomplete work shall be considered to be the supplies and services required by this contract, for which delivery and invoicing by the Contractor and acceptance by the Government are incomplete.

(6) The total amount of progress payments shall not exceed 80 percent of the total contract price.

(7) If a progress payment or the unliquidated progress payments exceed the amounts permitted by subparagraphs (a)(4) or (a)(5) above, the Contractor shall repay the amount of such excess to the Government on demand.

(8) Notwithstanding any other terms of the contract, the Contractor agrees not to request progress payments in dollar amounts of less than \$2,500. The Contracting Officer may make exceptions.

(b) Liquidation. Except as provided in the Termination for Convenience of the Government clause, all progress payments shall be liquidated by deducting from any payment under this contract, other than advance or progress payments, the unliquidated progress payments, or 80 percent of the amount invoiced, whichever is less. The Contractor shall repay to the Government any amounts required by a retroactive price reduction, after computing liquidations and payments on past invoices at the reduced prices and adjusting the unliquidated progress payments accordingly. The Government reserves the right to unilaterally change from the ordinary liquidation rate to an alternate rate when deemed appropriate for proper contract financing.

(c) Reduction or suspension. The Contracting Officer may reduce or suspend progress payments, increase the rate of liquidation, or take a combination of these actions, after finding on substantial evidence any of the following conditions:

(1) The Contractor failed to comply with any material requirement of this contract (which includes paragraphs (f) and (g) below).

(2) Performance of this contract is endangered by the Contractor's (i) failure to make progress or (ii) unsatisfactory financial condition.

(3) Inventory allocated to this contract substantially exceeds reasonable requirements.

(4) The Contractor is delinquent in payment of the costs of performing this contract in the ordinary course of business.

(5) The unliquidated progress payments exceed the fair value of the work accomplished on the undelivered portion of this contract.

(6) The Contractor is realizing less profit than that reflected in the establishment of any alternate liquidation rate in paragraph (b) above, and that rate is less than the progress payment rate stated in subparagraph (a)(1) above.

(d) Title. (1) Title to the property described in this paragraph (d) shall vest in the Government. Vestiture shall be immediately upon the date of this contract, for property acquired or produced before that date. Otherwise, vestiture shall occur when the property is or should have been allocable or properly chargeable to this contract.

(2) "Property," as used in this clause, includes all of the below-described items acquired or produced by the Contractor that are or should be allocable or properly chargeable to this contract under sound and generally accepted accounting principles and practices.

(i) Parts, materials, inventories, and work in process;

(ii) Special tooling and special test equipment to which the Government is to acquire title under any other clause of this contract;

(iii) Nondurable (i.e., noncapital) tools, jigs, dies, fixtures, molds, patterns, taps, gauges, test equipment, and other similar manufacturing aids, title to which would not be obtained as special tooling under subparagraph (ii) above; and

(iv) Drawings and technical data, to the extent the Contractor or subcontractors are required to deliver them to the Government by other clauses of this contract.

(3) Although title to property is in the Government under this clause, other applicable clauses of this contract; e.g., the termination or special tooling clauses, shall determine the handling and disposition of the property.

(4) The Contractor may sell any scrap resulting from production under this contract without requesting the Contracting Officer's approval, but the proceeds shall be credited against the costs of performance.

(5) To acquire for its own use or dispose of property to which title is vested in the Government under this clause, the Contractor must obtain the Contracting Officer's advance approval of the action and the terms. The Contractor shall (i) exclude the allocable costs of the property from the costs of contract performance, and (ii) repay to the Government any amount of unliquidated progress payments allocable to the property. Repayment may be by cash or credit memorandum.

(6) When the Contractor completes all of the obligations under this contract, including liquidation of all progress payments, title shall vest in the Contractor for all property (or the proceeds thereof) not--

(i) Delivered to, and accepted by, the Government under this contract; or

(ii) Incorporated in supplies delivered to, and accepted by, the Government under this contract and to which title is vested in the Government under this clause.

(7) The terms of this contract concerning liability for Government-furnished property shall not apply to property to which the Government acquired title solely under this clause.

(e) Risk of loss. Before delivery to and acceptance by the Government, the Contractor shall bear the risk of loss for property, the title to which vests in the Government under this clause, except to the extent the Government expressly assumes the risk. The Contractor shall repay the Government an amount equal to the unliquidated progress payments that are based on costs allocable to property that is damaged, lost, stolen, or destroyed.

(f) Control of costs and property. The Contractor shall maintain an accounting system and controls adequate for the proper administration of this clause.

(g) Reports and access to records. The Contractor shall promptly furnish reports, certificates, financial statements, and other pertinent information reasonably requested by the Contracting Officer for the administration of this clause. Also, the Contractor shall give the Government reasonable opportunity to examine and verify the Contractor's books, records, and accounts.

(h) Special terms regarding default. If this contract is terminated under the Default clause, (i) the Contractor shall, on demand, repay to the Government the amount of unliquidated progress payments and (ii) title shall vest in the Contractor, on full liquidation of progress payments, for all property for which the Government elects not to require

delivery under the Default clause. The Government shall be liable for no payment except as provided by the Default clause.

(i) Reservations of rights. (1) No payment or vesting of title under this clause shall (i) excuse the Contractor from performance of obligations under this contract or (ii) constitute a waiver of any of the rights or remedies of the parties under the contract.

(2) The Government's rights and remedies under this clause (i) shall not be exclusive but rather shall be in addition to any other rights and remedies provided by law or this contract and (ii) shall not be affected by delayed, partial, or omitted exercise of any right, remedy, power, or privilege, nor shall such exercise or any single exercise preclude or impair any further exercise under this clause or the exercise of any other right, power, or privilege of the Government.

(j) Financing payments to subcontractors. The financing payments to subcontractors mentioned in paragraphs (a)(1) and (a)(2) of this clause shall be all financing payments to subcontractors or divisions, if the following conditions are met:

(1) The amounts included are limited to--

(i) The unliquidated remainder of financing payments made; plus

(ii) Any unpaid subcontractor requests for financing payments.

(2) The subcontract or interdivisional order is expected to involve a minimum of approximately 6 months between the beginning of work and the first delivery; or, if the subcontractor is a small business concern, 4 months.

(3) If the financing payments are in the form of progress payments, the terms of the subcontract or interdivisional order concerning progress payments--

(i) Are substantially similar to the terms of this clause for any subcontractor that is a large business concern, or this clause with its Alternate I for any subcontractor that is a small business concern;

(ii) Are at least as favorable to the Government as the terms of this clause;

(iii) Are not more favorable to the subcontractor or division than the terms of this clause are to the Contractor;

(iv) Are in conformance with the requirements of FAR 32.504(e); and

(v) Subordinate all subcontractor rights concerning property to which the Government has title under the subcontract to the Government's right to require delivery of the property to the Government if--

(A) The Contractor defaults; or

(B) The subcontractor becomes bankrupt or insolvent.

(4) If the financing payments are in the form of performance-based payments, the terms of the subcontract or interdivisional order concerning payments--

(i) Are substantially similar to the Performance-Based Payments clause at FAR 52.232-32 and meet the criteria for, and definition of, performance-based payments in FAR Part 32;

(ii) Are in conformance with the requirements of FAR 32.504(f); and

(iii) Subordinate all subcontractor rights concerning property to which the Government has title under the subcontract to the Government's right to require delivery of the property to the Government if--

(A) The Contractor defaults; or

(B) The subcontractor becomes bankrupt or insolvent.

(5) If the financing payments are in the form of commercial item financing payments, the terms of the subcontract or interdivisional order concerning payments--

(i) Are constructed in accordance with FAR 32.206(c) and included in a subcontract for a commercial item purchase that meets the definition and standards for acquisition of commercial items in FAR Parts 2 and 12;

(ii) Are in conformance with the requirements of FAR 32.504(g); and

(iii) Subordinate all subcontractor rights concerning property to which the Government has title under the subcontract to the Government's right to require delivery of the property to the Government if--

(A) The Contractor defaults; or

(B) The subcontractor becomes bankrupt or insolvent.

(6) If financing is in the form of progress payments, the progress payment rate in the subcontract is the customary rate used by the contracting agency, depending on whether the subcontractor is or is not a small business concern.

(7) Concerning any proceeds received by the Government for property to which title has vested in the Government under the subcontract terms, the parties agree that the proceeds shall be applied to reducing any unliquidated financing payments by the Government to the Contractor under this contract.

(8) If no unliquidated financing payments to the Contractor remain, but there are unliquidated financing payments that the Contractor has made to any subcontractor, the Contractor shall be subrogated to all the rights the Government obtained through the terms required by this clause to be in any subcontract, as if all such rights had been assigned and transferred to the Contractor.

(9) To facilitate small business participation in subcontracting under this contract, the Contractor shall provide financing payments to small business concerns, in conformity with the standards for customary contract financing payments stated in FAR 32.113. The Contractor shall not consider the need for such financing payments as a handicap or adverse factor in the award of subcontracts.

(k) Limitations on Unfinalized Contract Actions. Notwithstanding any other progress payment provisions in this contract, progress payments may not exceed 80 percent of costs incurred on work accomplished under unfinalized contract actions. A "contract action" is any action resulting in a contract, as defined in Subpart 2.1, including contract modifications for additional supplies or services, but not including contract modifications that are within the scope and under the terms of the contract, such as contract modifications issued pursuant to the Changes clause, or funding and other administrative changes. This limitation shall apply to the costs incurred, as computed in accordance with paragraph (a) of this clause, and shall remain in effect until the contract action is finalized. Costs incurred which are subject to this limitation shall be segregated on Contractor progress payment requests and invoices from those costs eligible for higher progress payment rates. For purposes of progress payment liquidation, as described in paragraph (b) of this clause, progress payments for unfinalized contract actions shall be liquidated at 80 percent of the amount invoiced for work performed under the unfinalized contract action as long as the contract action remains unfinalized. The amount of unliquidated progress payments for unfinalized contract actions shall not exceed 80 percent of the maximum liability of the Government under the unfinalized contract action or such lower limit specified elsewhere in the contract. Separate limits may be specified for separate actions.

(l) Due date. The designated payment office will make progress payments on the 30<sup>th</sup> day after the designated billing office receives a proper progress payment request. In the event that the Government requires an audit or other review of a specific progress payment request to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the specified due date. Progress payments are considered contract financing and are not subject to the interest penalty provisions of the Prompt Payment Act.

(End of clause)

#### 52.236-1 PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984)

The Contractor shall perform on the site, and with its own organization, work equivalent to at least Twenty percent (20%) of the total amount of work to be performed under the contract. This percentage may be reduced by a supplemental agreement to this contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government.

(End of clause)

#### 52.252-2 CLAUSES INCORPORATED BY REFERENCE (FEB 1998)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es):

[www.arnet.gov/far](http://www.arnet.gov/far)  
<http://farsite.hill.af.mil>  
<http://www.dtic.mil/dfars>

(End of clause)



SECTION 00800

SPECIAL CONTRACT REQUIREMENTS

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SECTION 00800

SPECIAL CONTRACT REQUIREMENTS

**1. COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK**

a. The Contractor shall be required to (i) commence work under this contract within 5 calendar days after the date the Contractor receives the Notice to Proceed, (ii) prosecute the work diligently, and (iii) complete work in the ready for use, not later than 210 calendar days after the date the Contractor receives the notice to proceed. The time stated for completion shall include final cleanup of the premises.

b. Location: The site of work is located on east bank of Middle Brook between Rt. 28 and Rt. 22 in the Borough of Bound Brook, Somerset County, New Jersey.

c. The Contractor shall furnish all labor, materials, equipment and services (except those furnished by the Government) for the following work:

Construction of the Segment U levee/floodwall from Route 28, proceeding north across the ShopRite Shopping Plaza to Route 22.

d. All work shall be in accordance with the drawings and specifications or instructions attached hereto and made a part thereof, or to be furnished hereafter by the Contracting Officer and subject in every detail to his supervision, direction, and instructions. (DoD FAR Supplement 52.236-7014)

e. Magnitude of Construction Project: The estimated value of the proposed work is between \$5,000,000 and \$10,000,000.

**f. Site Description and Soil and Groundwater Chemistry Characterization**

**1) Site Information**

Test results, provided in drawing Sheet 40, indicate levels of several tested constituents exceeding New Jersey Department of Environmental Protection guidance Non-Residential Direct Contact Soil Cleanup Criteria. Soil reuse for non-hazardous material exceeding NJDEP Soil Cleanup Criteria must be coordinated with the NJDEP. Refer to NJDEP's 1998 Revised Guidance Document for the Remediation of Contaminated Soils for soil reuse management. Testing of soil material to be excavated and removed from the site should be coordinated with the NJDEP Division of Solid and Hazardous Waste, Bureau of Landfill and Recycling Management and the recycling or disposal facility chosen to accept the material. The soil testing results provided herein should be used only as a reference due to the time which has elapsed since sampling was conducted, and the difference in location of the sampling

holes to the location of soil to be excavated. Testing of the soil material to be excavated in some locations may reveal that sediment in that location does not contain contaminants exceeding NJDEP Soil Cleanup Criterial.

## **2. LIQUIDATED DAMAGES - CONSTRUCTION (APR 1984)**

- a. If the Contractor fails to complete the work within the time specified in the Contract, or any extension, the Contractor shall pay to the Government as liquidated damages, the sum of \$900 for each day of delay.
- b. If the Government terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the Government in completing the work.
- c. If the Government does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted. (FAR 52.212-5)
- d. At a time before the project is physically complete but is functionally complete to the satisfaction of the Government, the Government at its sole discretion may agree to accept transfer of the facility or project provided that the remaining work to be done ("punchlist") is completed no later than 30 days from the date of transfer. In this case the Contractor shall pay liquidated damages for punchlist items not completed in the daily amount of \$100 per day commencing after 30 days of project transfer or after date required for project completion (including all extensions), whichever occurs later.

## **3. EQUAL OPPORTUNITY PREAWARD CLEARANCE OF SUBCONTRACTS (1984 APR) (FAR 52.222-28)**

Notwithstanding the clause of this contract entitled "Subcontracts" the Contractor shall enter into a first-tier subcontract for an estimated or actual amount of \$1 million or more without obtaining in writing from the Contracting Officer a clearance that the proposed subcontractor is in compliance with the equal opportunity requirements and therefore is eligible for award.

## **4. CERTIFICATES OF COMPLIANCE**

Any Certificates required for demonstrating proof of compliance of materials with specification requirements shall be executed in 4 copies. Each certificate shall be signed by an official authorized to certify in behalf of the manufacturing company and shall contain the name and address of the Contractor, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification shall not be construed as relieving the Contractor from furnishing satisfactory material, if, after tests are performed on selected samples, the material is found not to meet the specific requirements. (ECI 7- 670.3)

## **5. BID GUARANTEE**

See Bid Guarantee Clause of Section 00700, CONTRACT CLAUSES.

## **6. CONTRACT DRAWINGS, MAPS AND SPECIFICATIONS (52.236-7001)**

See Contract Drawings, Maps and Specifications Clause of Section 00700, CONTRACT CLAUSES.

See Index Drawing (Sheet 1 of 42) for list of contract drawings.

## **7. RECORD DRAWINGS (R 6-01)**

a. General: The Contractor will maintain as-built drawings during the construction period and will submit final record drawings at the completion of individual facilities. The Government will provide to the Contractor the CAD (Computer-Aided Drafting) files consisting of compact (computer) disks or magnetic media of the drawing files in the appropriate CAD format (i.e. "Microstation", "Autocad", etc.) for the project. The Contractor is required to make prints or mylars from the CAD files and continuously maintain drawings to show current as-built conditions for the duration of the construction. Except for updates as indicated below, the Contractor may maintain as-built drawings by marking up drawings by hand or by CAD methods. Scanned drawings will not be acceptable. If the Government cannot provide CAD files for the project drawings, mylar (reproducible) drawings will be provided. The contractor will then be required to comply with all requirements indicated herein by the use of hand drafting.

b. Progress As-built Prints: During construction the Contractor is responsible for maintaining up to date one set of paper prints to show as-built construction conditions. These prints shall be kept current and available on the job site at all times. All changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction shall be accordingly and neatly recorded as they occur by means of details and notes. The as-built prints will be jointly inspected for accuracy and completeness by the Contracting Officer's Representative and a responsible representative of the Contractor prior to submission of each monthly pay estimate. Progress as-builts shall show the following information, but not limited thereto:

(1) The location and description of any utility lines, valves, or other installations of any kind within the construction area. The location includes dimensions to permanent features. Average depth below surface shall also be indicated.

(2) The location and dimensions of any changes with the building and structure.

(3) Correct grade or alignment of roads, structures or utilities if any changes were made from the contract plans.

(4) Correct elevations if changes were made in site grading

(5) Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor including but not limited to fabricated, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.

(6) The topography and grades of all drainage installed or affected as part of the project construction.

(7) All changes, which result from contract modifications.

(8) Where contract drawings or specifications allow options, only the option selected for construction shall be shown on the as-built prints.

(9) Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler and irrigation systems.

(10) All amendments to the contract drawings issued during the solicitation period shall be posted on the as-built drawings.

c. Hand Drafting: If mylars only are provided to the Contractor, they shall be updated using hand drafting. Only personnel proficient in the preparation of engineering drawings to standards satisfactory and acceptable to the Government shall be employed to modify the mylar reproduction drawings or prepare additional new drawings. All additions and corrections to the contract drawings shall be neat, clean and legible, and shall match the adjacent line work and/or lettering being annotated in type, density, size and style. All drafting work shall be done using the same medium (pencil, plastic lead or ink) that was employed on the original contract drawings and with graphic lead on paper base material. The title block to be used for any new as-built drawings shall be similar to that used on the original contract drawings.

d. Protection of Records: The Contractor shall be responsible for the protection and safety of mylars and CAD record until returned to the Contracting Officer. Any drawings damaged or lost by the Contractor shall be satisfactorily replaced by the Contractor at his expense.

e. 50% As-Built Update: At the 50% point in construction of this project (as determined by progress payments) the Contractor will update the CAD files of the project drawings in the appropriate CAD program to show as-built conditions as above, and submit an updated computer disk and one set of prints to the Contracting Officer for approval. If mylars only are provided to the Contractor, they shall be updated at this stage using hand-drafting as specified herein, and the Contractor shall submit one set of prints to the Contracting Officer for approval. Any required corrections will be made by the Contractor before payment will be approved for this item. The Contractor must use the updated CAD record or mylar drawings to produce required prints.

f. Preliminary Record Drawing Submittal: At least thirty calendar (30) days before the anticipated date of final acceptance inspection the Contractor shall deliver two copies of progress prints showing final as-built conditions to the Contracting Officer for review and approval. These prints shall correctly show all the features of the project as it has been constructed, adding such additional drawings as may be necessary. They shall be printed from the CAD files updated in the appropriate CAD program, or from updated mylars if mylars only were provided to the Contractor. Within ten days, the Government will provide the Contractor one set of prints indicating required corrections to the preliminary submittal. Contractor will correct and resubmit within 5 days. Any required subsequent review and resubmission periods will each be accomplished within 5 days. Upon Government approval of the preliminary submittal, the Contractor will prepare final record drawings.

g. Record Drawing Submission: In the appropriate CAD program each drawing shall be marked with the words "RECORD DRAWING AS-BUILT" followed by the name of the Contractor in font which will print at least 3/16" high. All revisions to the original contract drawings will be dated in the revision block. All prints and mylars must be reproduced from the updated CAD files. If mylars only were provided to the Contractor, they shall be hand-lettered or stamped as indicated above, and revisions shown in revision block. A minimum of 5 calendar days before the anticipated date of final acceptance inspection of the project the Contractor shall deliver to the Contracting Officer:

Three (3) CD's (ROM) of CAD files of Record Drawings.

One (1) set of Mylar Record Drawings

One (1) copy of prints of Record Drawings.

Failure to make an acceptable submission of Record Drawings will delay the Final Acceptance Inspection for the project and shall be cause for withholding any payment due the Contractor under this contract..

h. Property: All paper prints, reproducible drawings and CAD files will become property of the Government upon final approval. Approval and acceptance of the final record drawings shall be accomplished before final payment is made to the Contractor.

i. Payment: No separate payment will be made for the as-built and record drawings or updating of CAD files required under this contract, and all costs in connection therewith shall be considered a subsidiary obligation of the Contractor.

## **8. PHYSICAL DATA**

Information and data furnished or referred to below are not intended representations or warranties but are furnished for information only. It is expressly understood that the Government will not be responsible for any deduction, interpretation, or conclusion drawn therefrom by the Contractor: (FAR 52.236-4) (APR 1984).

a. Weather Conditions: Climatological data determined from records of the U.S. Weather Bureau station, Elizabeth, New Jersey

Mean Annual Temperature: 54 degrees F.

Mean Annual Precipitation: 46 inches

See paragraph 31 for time extensions for unusually severe weather.

b. Survey and Subsurface Investigations: The physical conditions indicated on the Contract Drawings and the Specifications are the result of site investigations by survey and SPT (Standard Penetration Testing) sampling. While the Government's procedures for subsurface investigations may produce representative information at their respective locations, local variation characteristics of the subsurface materials of this region are to be expected. Should any question or discrepancy arise, the condition should be independently confirmed by the Contractor.

c. Transportation Facilities: Interstate 78, Interstate 287 and New Jersey State Routes 28 and 22 are located in the vicinity of the Project area. The Contractor shall make his own investigation of available roads for transportation, load limits of bridges and roads, and other road conditions affecting the transportation of materials, equipment, supplies and other facilities to the site. The Contractor shall also construct such temporary haul roads and bridges as may be necessary for the conduct of his work. Any such temporary construction shall be restored to its original condition at the completion of the Contract. All costs for the use of existing transportation facilities, for the construction of temporary facilities, and for maintenance, repair, removal and restoration shall be the responsibility of the Contractor.

## **9. PAYMENT FOR MATERIALS DELIVERED OFF-SITE**

Pursuant to the Contract Clauses in this contract titled "Payments Under Fixed-Price Construction Contracts", materials delivered to the Contractor at locations other than the site of the work may be taken into consideration in making payments if included in payment estimates and if all the conditions of the Contract Clauses are fulfilled. Payment for items delivered to locations other than the work site will be limited to those materials which have been approved, if required by the technical provisions; those materials which have been fabricated to the point where they are identifiable to an item of work required under this contract. Such payment will be made only after receipt of paid or receipted invoices or invoices with cancelled check showing title to the items in the prime contractor and including the value of materials and labor incorporated into the item. (EFARS 52.2/9102E)

## **10. EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE (EFARS 52.2/9108 (f))**

a. Allowable cost for construction plant and equipment in sound workable condition owned or controlled and furnished by a Contractor or subcontractor at any tier shall be based on actual cost data when the government can determine both ownership and operating costs for each piece of equipment or equipment groups of similar serial and series from the Contractor's accounting records. When both ownership and operating costs cannot be determined from the Contractor's accounting records, equipment costs shall be based upon the applicable provisions of EP 1110-1-8,\* "Construction Equipment Ownership and Operating Expense Schedule," Region 1. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified Otherwise by the contracting officer. For equipment not included in the schedule, rates for comparable pieces or equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retrospective pricing, the schedule in effect at the time the work was performed shall apply.

(\* This manual can be ordered from the Government Printing Office by calling Tel. No. (202) 783-3238. There is a charge for the manual.)

b. Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(ii) and FAR 31.205-36 substantiated by certified copies of paid invoices. Rates for equipment rented from an organization under common control, lease-purchase or sale-leaseback arrangements will be determined using the schedule except that rental costs

leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated leases are allowable. Costs for major repair and overhaul are unallowable.

c. When actual equipment costs are proposed and the total amount of the pricing action is over \$25,000, cost or pricing data shall be submitted on Standard Form 1411, "Contract Pricing Proposal Cover Sheet." By submitting cost or pricing data, the Contractor grants to the Contracting Officer or an authorizing representative the right to examine those books, records, documents and other supporting data that will permit evaluation of the proposed equipment costs. After price agreement the Contractor shall certify that the equipment costs or pricing data submitted are accurate, complete and current.

## **11. ALTERATIONS IN CONTRACT (APR 1984)**

Portions of this contract are altered as follows:

Add the following sentence to paragraph "g" of basic contract clause, SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (1984 APR):

"Upon completing the work under this contract, the Contractor shall furnish a complete set of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the equipment is completed and accepted."

Alt.1 (APR 1984)(FAR 52.236-21)

## **12. AVAILABILITY AND USE OF UTILITY SERVICES (APR 1984)**

a. The Government shall make all reasonable amounts of utilities available to the Contractor without charge from existing outlets and supplies available to the Government on military installations. Otherwise the contractor shall make arrangements with local utility companies for connection, metering and payment for utilities at its expense. The Contractor shall carefully conserve any utilities furnished without charge. If the use of utilities is abused the Contractor will be required to meter and pay for utilities.

b. The Contractor, at its expense and in a workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters where required. The Contractor shall furnish to the Contracting Officer Representative a complete system layout drawing showing type of materials to be used and method of installation for all temporary electrical systems. Telephone service is the responsibility of the Contractor. The Contractor shall maintain all temporary lines in a workmanlike manner satisfactory to the Contracting Officer Representative. Before final acceptance of the work by the Government, the Contractor shall remove all temporary connections, distribution lines, meters and associated paraphernalia. (FAR 52.235-14).

c. Utility Service Interruptions. The Contractor shall submit written notification not less than 15 calendar days in advance of each interruption of each utility and communication service to or within existing buildings and facilities being used by others. No single outage will exceed 4 hours unless approved in writing. The time and duration of all outages will be coordinated with the Using Agency by the Contracting Officer Representative. All outages or interruptions shall be scheduled during weekends, unless specifically approved by the Contracting Officers Representative.

d. Digging Permits and Road Closings. No excavation whether minor or major including trenching, sidewalk replacement, etc. will be permitted without an approved digging permit. No road closure will be permitted without an approved permit. The Contractor shall allow 14 calendar days from date of written application to receive permission to dig and to close roads. Contractor will ascertain the name of the individual to submit the application from Government representative. Contractor shall carefully avoid contact or damage with any known or identified underground utilities. Roads shall only be closed one lane at a time, and vehicular traffic shall be allowed to pass through the construction area. Work on or near roadways shall be flagged in accordance with the safety requirements in Safety and Health Requirements Manual EM 385-1-1, which forms a part of these specifications. Work located along the alert force route

shall not cause blockage, and the Contractor shall maintain unobstructed access for alert force traffic at all times. Contractor shall apply for renewal of work permits as required if the work continues beyond the original permit expiration date.

e. Metal Burning and Welding and Access to Confined Spaces. Permits for such work shall be obtained in advance as required by the operator of the facility. Contractor shall coordinate through Government Representative for such permits.

f. The contractor shall apply for the necessary utility hookup permits from the Borough of Bound Brook Construction Office at no additional expense to the Government.

### **13. LAYOUT OF WORK**

a. The Government will establish the following base lines and bench marks at the site of the work: (Monuments and bench marks as shown on the drawings.)

b. From the base lines and bench marks established by the Government, the Contractor shall complete the layout of the work and shall be responsible for all measurements that may be required for the execution of the work to the location and limit marks prescribed in the specifications or on the contract drawings, subject to such modifications as the Contracting Officer may require to meet changed conditions or as a result of necessary modifications to the contract work.

c. The contractor shall furnish, at his own expense, such stakes, templates, platforms, equipment, tools and material, and all labor as may be required in laying out any part of the work from the base lines and bench marks established by the Government. It shall be the responsibility of the Contractor to maintain and preserve all stakes and other marks established by the Contracting Officer until authorized to remove them, and if such marks are destroyed by the Contractor or through his negligence prior to their authorized removal, they may be replaced by the Contracting Officer, at his discretion, and the expense of replacement will be deducted from any amounts due or to become due the Contractor. The Contracting Officer may require that work be suspended at any time when location and limit marks established by the Contractor are not reasonably adequate to permit checking of the work.

### **14. FIELD OFFICE AND VEHICLE**

a. The Contractor shall furnish at the job site, prior to the start of work, a lockable new field office and new equipment for the use of the Contracting Officer, meeting the following requirements:

b. A raised walkway w/stairs completely enclosed from the weather with minimum two doors shall connect office space consisting of multiple trailers. Shop drawings shall be submitted for approval prior to site selection and construction.

c. The office shall be located immediately adjacent to the project site within view of the levee construction project.

d. The following new equipment shall be submitted for approval:

-Office space with six (6) rooms of not less than 800 SF, with lockable interior doors, the space (if rented in a building) shall be in new condition. Each office shall contain at least two operable windows with screens.

-One (1) partitioned meeting area having a minimum of 1,680 square feet of open floor area.

-Six (6) office desks with lockable drawers (60 inches x 30 inches) laminated top and high-back cloth swivel chairs.



-Seven (7) Telephones: 6 separate telephones with extension and intercom connection, a separate cordless station phone 900 MHz (2) line (Total 7 Units). Telephone shall be two lines with twenty number memories. Phone service shall be applied in USACE's name and itemized bills paid by the Government. Installation and phone company fees to be paid by the Contractor. The Contractor shall arrange for the telephone service and instruments as follows:

- \* 2 lines with 6 instruments, 10 jacks, for voice communications and intercom.
- \* 1 line dedicated for use by fax machines.
- \* 1 line dedicated for use by (2) DSL able modems with Verizon ISP.
- \* 1 TCIP modem line for the network computer.
- \* 1 cable/DSL router with minimum 4 port switch to create a VPN (Virtual Private Networking)

-One (1) two line digital telephone answering machine with remote answering and access capability and voice time/day stamp.

-Three (3) Fire proof, 4 drawer, legal size lockable filing cabinets.

-Two (2) Shelf set, four shelves high x 12 inches deep x 3 feet long, (attachable to wall).

-One (1) Plain paper fax machine with a dedicated telephone line and an adequate supply of paper. The Contractor shall replenish the supply of fax paper, weekly as required by the Contracting Officer.

-Three (3) new IBM compatible personal computer P6/450 Pentium IV or equivalent with computer desk with printer stand, to be supplied complete in all respects to the Contracting Officer within 10 days of notice to proceed, including for each machine:

-One of the three computers shall be set up as a network server for the remaining two units. The computer shall be set up for a scanner, plotter and two printers as well as the feed for digital camera inputs by means of a "SCUZZY" multi port card or equal.

- \* Pentium IV processor running at 450 MHz Pentium II with 3d TECHNOLOGY
- \* High speed cache memory controller with 512 KB L2 PIPELINE BURST
- \* Ethernet Network card
- \* (1) 3.5" 1.44 MB diskette drives with drive controller
- \* 60 GB hard drive with 512 MB memory
- \* multi I/O card
- \* 7 expansion slots and two USB ports
- \* Sound Card W/SPEAKERS
- \* Enhanced Natural (i.e. split) 101 keyboard
- \* Windows 2000 Professional
- \* 6 outlet surge protector
- \* TFT, digital FLAT SCREEN COLOR monitor-18 inch equal to Compaq Presario FP500 or better with 60MB 100 MGZ (AGPZ).
- \* 60Mb 100MHz (AGPZ) 3D color graphics card minimum
- \* Hewlett-Packard Desk Jet 2000C Color Printer or equivalent printer with ability to print 8 pages per minute with at least 200 sheets per input tray
- \* 10,000 sheets of 8-1/2 x 11 laser type print paper
- \* Original DOS manual and disks installed
- \* Mouse w/pad
- \* Modem 56000 Baud v90 x2
- \* Voice recognition software with 95% accuracy and microphone
- \* Software 95% Scan OCR Accuracy
- \* CD ROM (dvd 40x/Speed)(INTERNAL)
- \* CD 52x40x52 R/W (READ/WRITE CD) W/ 20 DISKS (INTERNAL)
- \* 250MB (internal) ZIP drive (or equal) which will read 250mb ZIP disks

- \* Windows 2000, AND WINDOWS NT
- \* Primavera for windows including all original disks and manuals or equivalent
- \* Microsoft Office Professional VERSION 2000ME including MS Word and Excel or equivalent able to read "Office" files without conversion
- \* Database manager
- \* Anti-Virus software 2 types
- \* Communication Software
- \* LYNX PHOTO IMAGING PHOTO PROCESSOR SOFTWARE AND FILE MANAGER OR EQUAL
- \* AUTO CAD VER 15 or equivalent
- \* All software shall be the latest version available, compatible with hardware, and shall be provided with CD ROM disks and manuals as installed
- \* Computer must be completely set up with DOS and the above software operable. Setup person will give an eight-hour demonstration period to show that all components are functioning properly and answer any questions the Contracting Officer may have ABOUT ANY PROGRAM
- \* ALL REQUIRED CABLES CONNECTORS AND WIRING TO CREATE THE COMPUTER NETWORK AND HARDWARE

The following new equipment shall also be provided:

- One (1) 19" Color TV with basic cable service with the Weather Channel available.
- Wall TV/VCR swivel mount with outlet surge protector.
- One (1) Digital Camera KODAK DC22 (OR EQUAL) 028 TO 105 ZOOM COMPACT WITH PROPRIETY SOFTWARE ESTABLISHED TO BE LEGAL COURT DOCUMENTS with case, spare battery and memory card, computer interface and program and desk charger.
- One (1) Video Cassette Recorder (VCR) VHS Format Record/Play ability.
- One (1) digital Video Camera, with TFT or LCD screen including computer interface, software, spare battery and memory card, case and charger.
- One (1) HP Design Jet 500 Color Plotter or equivalent connected to both computers via printer switching terminals with STAND AND ROLL PAPER FEED W/ (10) ROLLS size E paper.
- One (1) HP Color Laserjet Printer, or equal.
- One (1) Optical scanner-legal size page 9600 DPI Enhanced with optical character reader and OMNI PAGE PRO software USB port interface with driver card TWAIN driver.
- Three (3) office conference tables, 2-1/2 feet by 8 feet with laminated top oval configuration.
- Eight (8) straight high back office chairs with wheels.
- One (1) Bulletin board, 3 feet x 5 feet.
- Six (6) wastebaskets with supply of bags.
- One (1) Vertical filing plan rack for twelve sets of E size0 plans.
- One (1) Drafting table FOR E size drawings and chair.
- Three (3) Office tables, 3 feet by 8 feet with laminated top.
- One (1) Heavy duty, digital dry process photocopying machine, with auto document feeder, sorter, collator, enlarging/reduction ability, 8.5 x 11; 1, 8.5 x 14 and 1, 11 x 17 paper trays and an adequate supply of copy paper and printing supplies. The supply of copy paper shall be replenished by the Contractor regularly as required by the Contracting Officer.
- two (2) Coat racks.
- One (1) Paper towel dispenser with towels.
- One (1) Paper cup dispenser with cups.
- One (1) Water cooler/heater.
- Toilet facilities as specified.
- One (1) Steel locking storage cabinet.
- One (1) Steel Construction Tool Box with locks (largest Model).
- All structures other than storage tool box installed under this paragraph FIELD OFFICE shall be provided with, as a minimum, the following services:

- \* Lighting. Electric light, non-glare types luminaries to provide a minimum illumination level of 50-foot candles at desk height level
- \* Heating and Cooling. Adequate equipment to maintain an ambient air temperature of 70 degrees F +/- 3 degrees
- \* Window Blinds
- \* Potable bottled water
- \* Fire Extinguisher. Non toxic, dry chemical, fire extinguisher meeting Underwriters Laboratories, Inc. approval for Class A, Class B, and Class C fires with a minimum rating of 10A; 20B; 10c
- \* Toilet. Two separate enclosed rooms power ventilated, heated and complying with applicable sanitary codes including hot and cold running water and flush type toilet
- \* Radio communication equipment including base station and two (2) portable units on the Contractor's frequency, all with desk chargers. If Contractor's frequency is not VHF then provide, in addition to the Contractor's frequency equipment, a VHF Base Station and FOUR (4) hand held VHF radios with desk chargers similar to ICOM IC-M125 (Base Station) and IC-M15 Hand Held.
- \* 24 hour electronic security alarm system with direct feed to local police department

-Janitorial services on a daily basis including, but not limited to, sweeping, emptying baskets. Weekly mopping, dusting all surfaces, servicing of toilets and washing and waxing of floors, cleaning all windows (inside and out) and re-supply of paper goods and soap.

-Sufficient supply of electrical outlets meeting NEC code for residential construction.

e. The Contractor shall be responsible for the monthly utility and telephone payment and installation cost of the above service and equipment.

e. The Contractor shall also supply a vehicle to the Area Engineer Staff for their own use. This vehicle shall be a new utility vehicle type six-passenger pick-up truck, with 4-wheel drive. Maintenance of the vehicle shall be the Contractor's responsibility.

f. No separate payment will be made for providing the above accommodations and all costs in connection therewith will be considered the obligation of the Contractor. The field office and facilities shall be removed from the project site at the original contract completion date or the extended contract completion date as directed by the Contracting Officer. No payment shall be made for Mobilization until the field office is complete and accepted.

## **15. BULLETIN BOARD**

Immediately upon beginning of work under this contract, the Contractor shall provide at the job site a weatherproof glass-covered bulletin board for displaying the fair employment poster, wage rates, and safety bulletins and posters. Emergency telephone numbers and reporting instructions for ambulance, physician, hospital, fire and police shall be posted. The bulletin board shall be located in a conspicuous place easily accessible to all and legible copies of the aforementioned data shall be displayed until work under the contract is completed. No direct payment will be made for the bulletin board.

## **16. QUANTITY SURVEYS (APR 1984)**

a. Quantity surveys shall be conducted, and the data derived from these surveys shall be used in computing the quantities of work performed and the actual construction completed and in place.

b. The Government shall conduct the original and final surveys and make the computations based on them. The Contractor shall conduct the surveys for any periods for which progress payments are requested and shall make the computations based on these surveys. All surveys conducted by the Contractor shall be conducted under the direction of a representative of the Contracting Officer, unless the Contracting Officer waives this requirement in a specific instance.

c. Promptly upon completing a survey, the Contractor shall furnish the originals of all field notes and all other records relating to the survey or to the layout of the work to the Contracting Officer, who shall use them as necessary to determine the amount of progress payments. The Contractor shall retain copies of all such material furnished to the Contracting Officer's representative. (FAR 52.236-16)

#### **17. SUPERINTENDENCE OF SUBCONTRACTORS (JAN 1965)**

a. The Contractor shall be required to furnish the following, in addition to the superintendence required by the Contract Clause titled, "SUPERINTENDENCE BY THE CONTRACTOR".

(1) If more than 50% and less than 70% of the value of the contract work is subcontracted, one superintendent shall be provided at the site and on the Contractor's payroll to be responsible for coordinating, directing, inspecting and expediting the subcontract work.

(2) If 70% or more of the value of the work is subcontracted, the Contractor shall be required to furnish two such superintendents to be responsible for coordinating, directing, inspecting and expediting the subcontract work.

b. If the Contracting Officer, at any time after 50% of the subcontracted work has been completed, finds that satisfactory progress is being made, he may waive all or part of the above requirement for additional superintendence subject to the right of the Contracting Officer to reinstate such requirement if at any time during the progress of the remaining work he finds that satisfactory progress is not being made. (DoD FAR Supplement 52.236-7008)

#### **18. SCHEDULING AND DETERMINATION OF PROGRESS**

Pursuant to the contract clause, SCHEDULES FOR CONSTRUCTION CONTRACTS, the Contractor shall prepare and submit for approval a practicable project schedule. The type of schedule and detailed requirements as well as timing of this submittal shall be as specified in specification section 'PROJECT SCHEDULE'.

This schedule will be the medium through which the timeliness of the Contractor's construction effort is appraised. When changes are authorized that result in contract time extensions, Contractor shall submit a modified schedule for approval by the Contracting Officer.

The terms of Contract Clause, SCHEDULING FOR CONSTRUCTION CONTRACTS, with reference to overtime, extra shifts, etc., may be invoked when the Contractor fails to start or complete work features or portions of same by the time indicated by the milestones dates on the approved project schedule, or when it is apparent to the Contracting Officer from the Contractor's actual progress that these dates will not be met.

Neither on the project schedule as originally submitted nor on any updated periodic schedules which the Contractor is required to prepare and submit, shall be actual progress to be entered include or reflect any materials which even though on the site, are not yet installed or incorporated in the work. For payment purposes only, an allowance will be made by the Contracting Officer of up to 100 percent of the invoiced cost of materials or equipment delivered to the site but not incorporated into the construction, pursuant to Contract Clause, PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS. The making of such an allowance will be contingent upon a determination by the Contracting Officer that the Contractor's compliance with the quality control requirements of the contract is more than satisfactory.

#### **19. PROCEDURES FOR SUBMISSION AND PAYMENT OF ALL CONTRACT PAYMENTS**

In addition to the requirements contained in the Contract Clause entitled "PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS" and to implement the requirements of the Prompt Payment Act Amendments of 1988, P.L. 100-496, the following shall apply to all payments made under this contract:

a. At the time of submission of the progress chart, the contractor shall submit for approval by the Contracting Officer or his authorized representative a breakdown of the contract work which shall be to the degree of detail required by the Contracting Officer or his representative to effect reasonable progress payments. The Contracting Officer or his representative shall review this breakdown within 30 calendar days after receipt and either advise the contractor that it is approved or disapproved, and if disapproved the reasons for disapproval. Only after the breakdown is approved shall any payment invoice be accepted from the contractor and any payment made to him. The Contracting Officer can determine if it is in the best interest of the Government to make payment without an approved breakdown, however, in no case shall more than 10% of the contract amount be paid unless the breakdown is approved.

b. The contractor shall submit his request for payment by submission of a proper invoice to the office or Person(s) designated in subparagraph (c). For purposes of payment a "proper invoice" is defined as the following:

(1) An estimate of the work completed in accordance with the approved breakdown indicating the percentage of work of each item and the associated costs.

(2) A properly completed Eng Form 93 and 93a (where required).

(3) All contractual submissions indicated elsewhere in this contract to be submitted with payment, such as updated progress schedules, updated submittal registers, etc.

(4) The following certification executed by a responsible official of the organization authorized to bind the firm. A "responsible official" would be either a corporate officer, partner, or owner, in the case of a sole proprietorship

I hereby certify, to the best of my knowledge and belief, that --

(a) The amounts requested are only for performance in accordance with the specifications, terms and conditions of the contract;

(b) Payments to subcontractors and suppliers have been made from previous payments received under the contract and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract requirements and the requirements of chapter 39 of Title 31, United States Code; and

(c) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract.

(d) All required prime and subcontractor payrolls have been submitted.

(Name)\_\_\_\_\_

(Title)\_\_\_\_\_

(Date)\_\_\_\_\_

c. The Government shall designate the office or person(s) who shall first receive the invoice submissions and the Contractor shall be so notified at the preconstruction conference. In addition to the designated Project Engineer, the Contractor shall at the same time submit one copy of the detailed breakdown and the Eng Form 93 and 93a Form to the Area Engineer.

d. The Government representative shall return any request for payment which is deemed defective within 7 days of receipt and shall specify the defects. If the defect concerns a disagreement as to the amount of work performed and/or the amount of the payment being submitted, the Government and the contractor's representative should meet to resolve the differences and reach agreement. Upon agreement, the contractor shall submit a new breakdown and Eng Form 93 (and 93a) and any other submissions requiring correction. These will be incorporated with the previous submittal and will then constitute a proper invoice.

e. If agreement cannot be reached, the Government shall determine the proper amount per Contract Clause, PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS and process the payment accordingly. In this event, a "proper invoice" for Prompt Payment Act purposes will not have been submitted to the Government.

f. The Government shall pay the contractor in accordance with the following time frames:

(1) Progress Payments - From the date a "proper invoice" is received, in accordance with subparagraphs b and d of this clause, the Government will issue a check within 14 calendar days.

(2) Reduction in Retainage Payment. If during the course of the contract, a reduction in retainage payment is required, the Government shall issue a check within 30 calendar days after the approval of the release to the contractor by the Contracting Officer or his authorized representative.

(3) Final Payment. A final payment request shall not be considered valid until the contractor has fulfilled all contract requirements including all administrative items, payrolls, warranties, etc. and has submitted a release of claims. When the contractor has fulfilled all contract requirements and a "proper invoice" has been submitted, the Government shall issue a check within 30 days from the date of acceptance of the project by the Contracting Officer.

## **20. SUBMISSION OF CLAIMS**

The following shall be submitted to the Contracting Officer at the following address: U.S. Army Corps of Engineers, New York District, 26 Federal Plaza, New York, New York 10278-0090:

- a. claims referencing or mentioning the Contracting Disputes Act of 1978
- b. requests for a written decision by the Contracting Officer
- c. claims certified in accordance with the Contract Disputes Act of 1978

No other Government representative is authorized to accept such requests. A copy shall also be provided to the Authorized Representative of the Contracting Officer.

The Contractor shall also provide the Contracting Officer with a copy of any requests for additional time, money or interpretation of contract requirements which were provided to the Authorized Representative of the Contracting Officer and which have not been resolved after 90 days.

## **21. PROGRESS PAYMENTS**

Progress Payments made pursuant to the PAYMENTS TO CONTRACTOR clause for any item of work in the bid schedule shall be based on the contract unit price or lump sum amount set forth in the bid schedule for that item of work.

If the amount of the unit price or lump sum bid for any item of work is in excess of 125% of the Government estimate for such item, the Contracting Officer may require the contractor to produce cost data to justify the price of the bid item. Failure to justify the bid item price to the satisfaction of the Contracting Officer may result in payment of an amount equal to 125% of the Government estimate for such bid item upon completion of work on the item and payment of the remainder of the bid item price upon final acceptance of all contract work.

## **22. PERFORMANCE EVALUATION OF CONTRACTOR (1985 JAN HQ USACE)**

As a minimum, the Contractor's performance will be evaluated upon final acceptance of the work. However, interim evaluation may be prepared at any time during contract performance when determined to be in the best interest of the Government.

The format for the evaluation will be SF 1421, and the Contractor will be rated either outstanding, satisfactory, or unsatisfactory in the areas of Contractor Quality Control, Timely Performance, Effectiveness of Management, Compliance with Labor Standards, and Compliance with Safety Standards. The Contractor will be advised of any unsatisfactory rating, either in an individual element or in the overall rating, prior to completing the evaluation, and all contractor comments will be made a part of the official record. Performance Evaluation Reports will be available to all DoD Contracting Officers for their future use in determining Contractor responsibility, in compliance with DFARS 36.201(c)(1).

## **23. SAFETY AND HEALTH REQUIREMENTS MANUAL**

If this contract is for construction or dismantling, demolition, or removal of improvements with any Department of Army agency or component, the Contractor shall comply with all pertinent provisions of the latest version of U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, in effect on the date of the solicitation. The latest edition of the U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1 and its changes are available at <http://www.hq.usace.army.mil> (at the HQ homepage select Safety and Occupational Health). Contractor shall be responsible for complying with the current edition and all changes posted on the web as of effective date of this solicitation.

Before commencing the work, the Contractor shall: (1) Submit a written proposal for implementing the Accident Prevention Plan; and (2) Meet with representatives of the Contracting Officer to discuss and develop a mutual understanding relative to administration of the overall safety program.

## **24. AUTHORIZED CONSTRUCTION AREA AND TRESPASSING**

The Contractor shall not inflict damage upon land and properties outside the authorized construction area by unwarranted entry upon, passage through, damage to, or disposal of, material on such land or property. The Contractor may make a separate agreement with any other party, regarding the use of, or right to, land or facilities outside the contract area. If such an agreement is made, it shall be in writing and a copy shall be furnished the Contracting Officer. The Contractor shall hold and save the Government, its officers, and agents free from liability of any nature or kind arising from any trespassing or damage occasioned by his operations.

## **25. DAMAGE TO WORK**

The responsibility for damage to any part of the permanent work shall be as set forth in the article of the contract clause entitled "PERMITS AND RESPONSIBILITIES". However, if in the judgment of the Contracting Officer, any part of the permanent work performed by the Contractor is damaged by flood, earthquake, hurricane, severe coastal storm or tornado, which damage is not due to the failure of the Contractor to take reasonable precautions or to exercise sound engineering and construction practices in the conduct of the work, the Contractor will make the repairs as ordered by the Contracting Officer and full compensation for such repairs will be made at the applicable contract unit or lump-sum prices as fixed and established in the contract. If, in the opinion of the Contracting Officer, there are no contract unit or lump

sum prices applicable to any part of such work, an equitable adjustment, pursuant to Contract Clause entitled CHANGES, will be made as full compensation for the repairs of that part of the permanent work for which there are not applicable contract unit or lump-sum prices. Except as herein provided, damage to all work, utilities, materials, equipment, and plant, including temporary construction and utilities, pavements, and other property along the routes used by the Contractor's pipelines and/or land vehicles, shall be repaired to the satisfaction of the Contracting Officer, the State of New Jersey, and the utilities companies, at the contractor's expense regardless of the cause of such damage.

## **26. ENVIRONMENTAL LITIGATION (1974 NOV) (OCE)**

a. If the performance of all or any part of the work is suspended, delayed, or interrupted due to an order of a court of competent jurisdiction as a result of environmental litigation, as defined below, the Contracting Officer, at the request of the Contractor, shall determine whether the order is due in any part to the acts or omissions of the Contractor or a Subcontractor at any tier not required by the terms of this contract. If it is determined that the order is not due in any part to acts or omissions of the Contractor or a Subcontractor at any tier other than as required by the terms of this contract, such suspension, delay, or interruption shall be considered as if ordered by the Contracting Officer in the administration of this contract under the terms of the "Suspension of Work" clause of this contract. The period of such suspension, delay or interruption shall be considered unreasonable, and an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) as provided in that clause, subject to all the provisions thereof.

b. The term "environmental litigation", as used herein, means a lawsuit alleging that the work will have an adverse effect on the environment or that the Government has not duly considered, either substantively or procedurally, the effect of the work on the environment. (ECI 7-671.10)

## **27. LABOR-ADDITIONAL REQUIREMENTS**

Fringe benefits statement: The method of payment of applicable fringe benefits will be indicated on DD Form 879, Statement of Compliance, and attached to each weekly payroll.

## **28. CRANE AND DRAGLINE SAFETY REQUIREMENTS**

In addition to meeting all applicable requirements of OSHA standards and Section 16 of the U. S. Corps of Engineers Manual, "Safety and Health Requirements", EM 385-1-1, dated 3 September 1996, all cranes used in performing the work set forth in these specifications shall be equipped with geared boom hoists or otherwise provided with mechanisms which will prevent the booms from failing free. Cranes that are equipped with booms that can be lowered either by gravity or by power shall have the mechanisms for operating the booms by gravity made inoperative so that the booms cannot be lowered by gravity. The booms of all cranes and draglines shall also be equipped with shock absorbing type back stops to prevent them from overtopping.

All cranes shall have a red strobe light and two flags attached to the end of the boom. The flags shall be 18-inches square and international orange in color. The strobe does not need to be flashing during daylight hours or when the boom is lowered to the ground at night. The strobe shall be flashing when operating during weather in which visibility is reduced or when operating at night. The strobe shall remain flashing if the boom remains elevated at night.

## **29. ACCESS AREA**

Areas designated on the drawings as "Access to Working Area" shall be used by the Contractor solely for the purpose of access to and from the "Work Limits". The Contractor shall arrange his use of these access areas so as to minimize interference with the property owners' (or user's) access or normal use.

## **30. TIME EXTENSIONS FOR UNUSALLY SEVERE WEATHER**



Notwithstanding any other provisions of this contract, it is mutually understood that the time extensions for changes in the work will depend upon the extent, if any, by which the changes cause delay in the completion of the various elements of construction. The change order granting the time extension may provide that the contract completion date will be extended only for those specific elements so delayed and that the remaining contract completion dates for all other portions of the work will not be altered and may further provide for an equitable readjustment of liquidated damages under the new completion schedule. (FAR 52.212-6)

1. This provision specifies the procedure for determination of time extensions for unusually severe weather in accordance with the contract clause entitled "Default: (Fixed Price Construction)". In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

a. The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

b. The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the contractor.

2. The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY  
WORK DAYS BASED ON (5) DAY WORK WEEK

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
(15)	(13)	(8)	(5)	(5)	(5)	(6)	(5)	(6)	(4)	(4)	(6)

3. Upon acknowledgment of the Notice to Proceed (NTP) and continuing throughout the contract, the contractor will record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the contractor's scheduled work day. The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph 2, above, the contracting officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the contract clause entitled "Default (Fixed Price Construction)".

### **31. VEHICULAR AND OTHER TRAFFIC CONTROL**

The Contractor shall be required to provide and maintain barriers, flagmen and warning devices during construction and hauling operations which may interfere with vehicular and other traffic. The Contractor shall also be required to effect necessary traffic control as required by the appropriate agencies. All safety precautions shall be subject to the approval of the Contracting Officer.

### **32. STORAGE AREAS**

The Contractor may store his required materials and equipment within the "Work Limits" shown on the drawings. No storage will be allowed outside the designated work limits and the Contractor shall make his own arrangements with parties or agencies involved for storage areas outside the work limits.

**33. VERIFICATION OF SMALL BUSINESS UTILIZATION**

- a. This clause is applicable to small business concerns whose contracts exceed \$1,000,000.
- b. In accordance with the clause at FAR 52.219-8, entitled UTILIZATION OF SMALL BUSINESS CONCERNS AND SMALL DISADVANTAGED BUSINESS CONCERNS, in effect on the date of this contract, the Contracting Officer may survey the extent of small and small disadvantaged business utilization under this contract. The Contractor may be required to report to the Contracting Officer statistical data on the number and dollars amounts of subcontracting awards with small businesses and small disadvantaged businesses.
- c. As appropriate, the Contracting Officer may require one or more follow-up reports to the initial report.
- d. The Contractor agrees to insert this clause in any subcontract that may exceed \$1,000,000, including this subparagraph (d).

**34. PRECONSTRUCTION CONFERENCE**

- a. A preconstruction conference will be arranged by the Contracting Officer, or his Representative, after award of contract and before commencement of work. The Contracting Officer's representative will notify the Contractor of the time and date set for the meeting. At this conference the Contractor will be oriented with respect to Government procedures and line of authority, contractual, administrative, and construction matters. Additionally, a schedule of required submittals will be discussed.
- b. The Contractor shall bring to this conference the following items in either completed or draft form:
  - The Contractor's order of work.
  - Accident Prevention Plan. (See Accident Prevention Clause in Section 00700 and paragraph 23 of this Section concerning Safety and Health Requirements Manual)
  - Quality Control Plan. (See Section 01451)
  - Letter appointing Superintendent.
  - List of subcontractors, if any.

**35. COORDINATION CONFERENCES**

Routine coordination conferences will be scheduled by the Contracting Officer throughout the life of this contract. Coordination conferences will be held to discuss contract administration, Contractor quality control, phasing, scheduling, and other aspects relating to this construction. The Corps of Engineers and the Contractor will be represented at each of these meetings. Similar information concerning replacement personnel shall be forwarded to the Contracting Officer, should any replacement be required at any time during the life of this contract. Coordination conferences will be scheduled to occur on a weekly basis.

**36. CONTRACTOR WORKING HOURS**

Unless specifically authorized by the Contracting Officer, contract work shall be restricted to the hours of 7:00 A.M. to 6:00 P.M., Mondays through Saturdays. No work will be permitted on Sundays and Federal and State legal holidays.

**37. PARTNERSHIP IMPLEMENTATION PLAN**

To more effectively accomplish this contract, the Government proposes to form a partnership with the Contractor. This partnership would draw on the strengths of each organization in an effort to achieve a quality product within budget and on schedule. This partnership would be bilateral in make-up and participation would be totally voluntary. If mutually agreed to by both parties, a facilitator satisfactory to both parties shall be hired who would be responsible to arrange for an offsite conference location, provide all workshop materials, and compile and distribute a completed partnering agreement to all participants within 30 days of the partnering session. Conference site location will be coordinated with the Contracting Officer for approval. The Contractor should plan for the attendance of approximately 15-20 individuals from the Government in addition to the Contractor's and subcontractor's personnel. The cost of the facilitator and conference facility will be shared equally by the Contractor and Government. All other costs associated with partnership implementation will be borne by the Contractor. It is anticipated that the partnership conference will be for one day each time and will be held on a monthly basis.

### **38. CONSTRUCTION PROJECT SIGNS AND PUBLIC SAFETY SIGN**

The Contractor shall construct three signs, one for project identification, one to show on-the-job safety performance, and one public safety sign. Sample sign drawings together with mounting and fabrication details are provided at the end of this section. The signs shall be erected within 15 calendar days after the date of Notice to Proceed. The project identification and safety performance signs are to be displayed side by side and mounted for reading by passing viewers. The public safety sign shall be the same size as the project signs.

Exact placement location will be designated by the Contracting Officer. Panels are fabricated using HDO (High Density Overlay) plywood with dimensional lumber uprights and bracing. The sign faces are non-reflecting vinyl. All legends are to be die-cut or computer-cut in the sizes and type-faces specified and applied to the white panel background following the graphic formats shown on the attached sheets. The Communications Red panel on the left side of the construction project sign with Corps signature (reverse version) is screen printed onto the white background.

The Contractor shall maintain the signs in good condition throughout the construction period. No separate payment will be made for erecting and maintaining the signs and all costs in connection therewith will be considered the obligation of the Contractor. Upon completion of the project, the Contractor shall remove the signs from the project site.

### **39. INSURANCE PROCURED BY CONTRACTOR**

a. At the Government's option, to be exercised in writing no later than 120 days after contract award, the Contractor and Subcontractor(s) shall procure and maintain during the entire period of its performance under this contract the following insurance policies:

(1) Commercial General/Public Liability Insurance in limits of not less than Five Million Dollars (\$5,000,000) combined single limit per occurrence for bodily injury, death, personal injury and/or property damage, including but not limited to coverage for premises-operations, products-completed operations, independent contractors, broad form property damage, property damage arising out of explosion, collapse or underground property damage hazards with a contractual liability endorsements covering the risks assumed under this agreement.

(2) Workers Compensation/Employers Liability and Occupational Disease Insurance with limits of One Million Dollars (\$1,000,000) each accident, One Million Dollars (\$1,000,000) policy limit and One Million Dollars (\$1,000,000) each employee.

(3) Comprehensive Automobile Liability Insurance in limits of not less than five million dollars (\$5,000,000) combined single limit per occurrence for bodily injury, death, and property damage covering all owned, non-owned and hired vehicles in connection with the work to be performed in connection with this permit.

4) Comprehensive General/Public Liability Insurance in limits of not less than One Million Dollars (\$1,000,000) per person and One Million Dollars (\$1,000,000) per occurrence for damages arising out of bodily injuries or death, and Property Damage limits of not less than One Million Dollars (\$1,000,000) for damage to or destruction of property, including the loss of use thereof, in any one occurrence and not less than \$1,000,000 in the aggregate.

(b) The policies described in Paragraphs a (1) and above shall be endorsed to include the Borough of Bound Brook, New Jersey; the County of Somerset, New Jersey; and the State of New Jersey; as additional insured parties. All policies described in Paragraphs a(1), a(2) and a(3) above shall contain a provision that the policies may not be cancelled, terminated or modified without thirty days written notice to the Contracting Officer, US Army Corps of Engineers, Contracting Officer, Contracting Division, 26 Federal Plaza, New York, New York 10278-0090; the Borough of Bound Brook, Borough Administrator, 230 Hamilton Street, Bound Brook, New Jersey 08805-2017; County of Somerset County, Board of Chosen Freeholders, County Administrator office, 21 North Bridge Street, Somerville, New Jersey 08876; and New Jersey Department of Environmental Protection, Coastal Engineering, Administrator, Division of Engineering & Construction, 1510 Hooper Avenue, Toms River, New Jersey 08753;

c. The General Liability policy requirements described in Paragraphs a

(1) and a (4) above shall not contain any provisions for exclusions from liability other than provisions for exclusions from liability forming part of the standard, basic unamended and unendorsed commercial general liability policy.

d. All liability policies shall be specifically endorsed to prohibit the insurance carrier from raising any defense involving in any way

jurisdiction of the Tribunal, immunity of the aforementioned insured

parties, governmental nature of the insured parties or the provisions of any statutes respecting suits against the insured parties without

obtaining written expressed advance permission from the Contracting

Officer and the District Counsel of the U.S. Army Corps of Engineers, New York District.

e. In the event the Government exercises the option provided for in this Section, the Contractor shall furnish to the Contracting Officer and the insured parties at the above addresses within five (5) calendar days of the award of the option a certificate of insurance or statement evidencing the above required insurance. The policies and the certificate of insurance evidencing required insurance shall contain an endorsement to the effect that cancellation or any material change in the policies adversely affecting the interests of the insured parties in such insurance shall not be effective for such a period as may be prescribed by the laws of the State in which this contract is to be performed and in no event less than thirty (30) days after written notice thereof to the Contracting Officer and the aforementioned insured parties. The Contracting Officer and the insured parties shall have the right, upon written notice, to receive copies of the policies required hereunder.

f. Prior to exercise of the option provided for in this Section, the Contractor will be required to submit to the Contracting Officer a certification from the Contractor's insurance carrier that the amount inserted by the Contractor in the item entitled "Additional Cost for Optional Insurance" of the Price Schedule represents only the additional premium paid by the Contractor as a direct result of the specific insurance requirements of this Section and excludes those premium costs which would have otherwise been incurred by the Contractor if the insurance option had not been exercised.

g. Prior to any exercise of the option provided for in this Section, the Contractor shall furnish a computation from his insurance carrier, which sets forth the elements of the said additional premium, including, but not limited to the following:

the additional costs of the parties being named as an additional insured broken down by policy type; any other additional costs due to the insurance requirement and the nature thereof.

h. Prior to any exercise of the option provided for in this Section, the Contractor shall furnish a computation as to that amount, if any, of the premium costs of his existing insurance coverage he is allocated to the work of this contract. The Contractor shall indicate whether such attribution is pursuant to a standard formula or cost administration practice or was otherwise derived.

i. The Government reserves the right to request a further elaboration with regard to this computation at any time before exercise of the option.

j. Failure to provide proof of the required insurance in paragraph "a", within the time stated in paragraphs "e" through "i" may result in a determination of lack of satisfactory progress.

k. The insurance coverage specified above in paragraph "a" shall be carried until the project is satisfactorily completed and formerly accepted by the Government. The above indicated insurance coverage shall be effected under standard form policies issued by insurers of financial responsibility that are rated "A" or better by Best's Insurance Reports, "AA" or better by Standard and Poor's Insurance Rating Service and "Aa" or better by Moody's Investors Service. The Government reserves the right to reject as inadequate any insurance coverage provided by an insurance company that is rated less than the ratings above by any of the aforementioned rating services.

l. The insurance coverage specified above in paragraph "a" shall be enforceable by any legitimate claimant after the termination or cancellation of the project, whether by expiration of time, by operation of law or otherwise, so long as the basis of the claim against the insurance company occurred during the project and when the insurance was in force.

m. Payment items for insurance premium procured by the Contractor under this paragraph shall be made at contract lump sum price listed in the **Bidding Schedule Item No. 0002**, All Work for Option 1, if the optional item is awarded.

#### **40. GOVERNMENT RESIDENT MANAGEMENT SYSTEM AND CONTRACTOR QUALITY CONTROL SYSTEM (QCS) MODULE**

The Government will utilize an in-house Contract Administration program entitled "Resident Management System" (RMS). The Contractor shall utilize a Government furnished Quality Control System (QCS) Programming Module. See Section 01312A "Quality Control System (QCS)" for requirements.

#### **41. SPECIAL SCHEDULING REQUIREMENTS FOR MECHANICAL AND ELECTRICAL SYSTEMS**

In reference to the contract clause entitled "PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS", see section entitled TESTING FOR MECHANICAL AND ELECTRICAL SYSTEMS for additional scheduling requirements for such systems.

- End of Section -

# PROJECT IDENTIFICATION SIGN CIVIL WORKS PROJECT

The graphic format for this 4' x 6' sign panel follows the legend guidelines and layout as specified below. The large 4' x 4' section of the panel in the right is to be white with black legend. The 2' x 4' section of the sign on the left with the full corps Signature (reverse version) is to be screen printed Communications Red on the white background. The castle insignia will be furnished by the Government in pressure sensitive vinyl for affixing by the Contractor. See attached sheet for fabrication and mounting guidelines.

**Legend Group 1:** One- to two-line description of Corps relationship to project  
Color: White  
Typeface: 1.25" Helvetica Regular  
Maximum line length: 19"

**Legend Group 2:** Division or District Name (optional). Place below 10.5" Reverse Signature (6" Castle)  
Color: White  
Typeface: 1.25" Helvetica Regular

**Legend Group 3:** One- to three-line project title legend describes the work being done under this contract.  
Color: Black  
Typeface: 3" Helvetica Bold  
Maximum line length: 42"

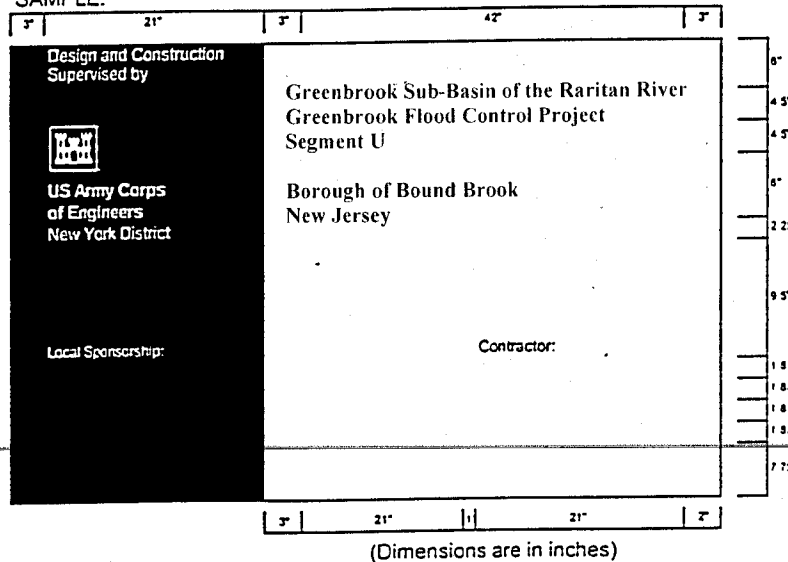
**Legend Group 4:** One- to two-line identification of project or facility (civil works) or name of sponsoring department (military).  
Color: Black  
Typeface: 1.5" Helvetica Regular  
Maximum line length: 42"

Cross-align the first of Legend Group 4 with the first line of the Corps Signature (US Army Corps) as shown.

**Legend Group 5a-b:** One- to five line identification of prime contractors including: type (architect, general contractor, etc.), corporate or firm name, city, state. Use of Legend Group 5 is optional.  
Color: Black  
Typeface: 1.25" Helvetica Regular  
Maximum line length: 21"

All typography is flush left and rag right upper and lower case with initial capitals only as shown. Letter and word spacing to follow Corps standards as specified in Appendix D

SAMPLE:



Sign Type	Legend	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
CID-01	various	4' x 6'	4' x 4'	H00-3	48"	WH-RO,BK

Show non-Federal local partner's name and logo

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

\* Refers to the U.S. Army Corps of Engineers, "Sign Standards Manual", EPS-310-1-6.

# SAFETY PERFORMANCE SIGN

The graphic format, color, size and type-faces used on the sign are to be reproduced exactly as specified below. The title with First Aid logo in the top section of the sign, and the performance record captions are standard for all signs of this type. Legend Groups 2 and 3 below identify the project and the contractor and are to be placed on the sign as shown. Safety record numbers are mounted on individual metal plates and are screw-mounted to the background to allow for daily revisions to posted safety performance record.

Legend Group 1: Standard two-line title "Safety is a Job Requirement", with (8" od.) Safety Green First Aid logo. Color: To match PMS 347 Typeface: 3" Helvetica Bold Color: Black

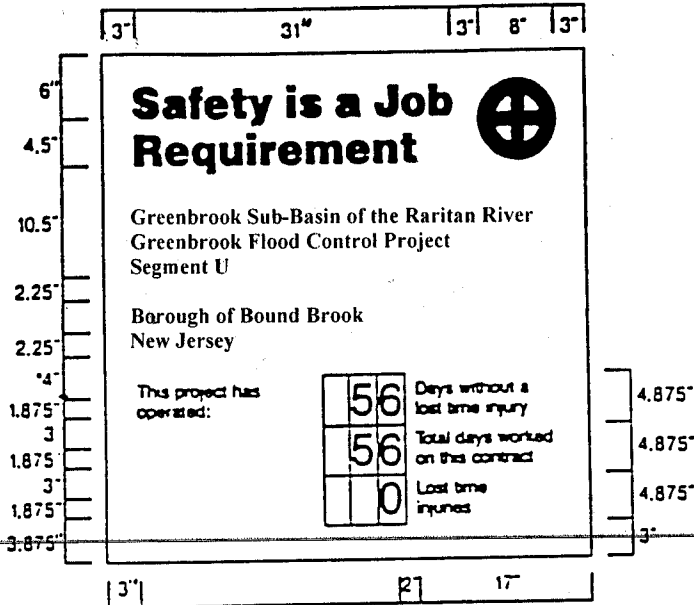
Legend Group 2: One- to two-line project title legend describes the work being done under this contract and name of host project. Color: Black Typeface: 1.5" Helvetica Regular Maximum line length: 42"

Legend Group 3: One- to two-line identification: name of prime contractor and city, state address. Color: Black Typeface: 1.5" Helvetica Regular Maximum line length: 42"

Legend Group 4: Standard safety record captions as shown. Color: Black Typeface: 1.25" Helvetica Regular

Replaceable numbers are to be mounted on white .060 aluminum plates and screw-mounted to background. Color: Black Typeface: 3" Helvetica Regular Plate size: 2.5" x .5"

All typography is flush left and rag right, upper and lower case with initial capitals only as shown. Letter- and word-spacing to follow Corps standards as specified in  
\* Appendix D.

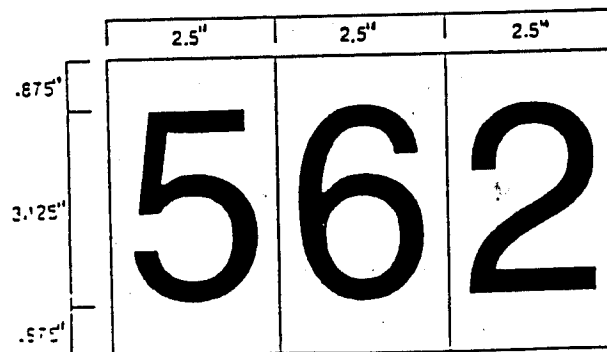


Dimensions in inches.

See attached sheet for fabrication and mounting guidelines.

\* Refers to the U.S. Army Corps of Engineers, "Sign Standards Manual", EPS-310-1-6.

Sign Type	Legend Size	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
CID-02	various	4' x 4'	4' x 4'	HDO-3	48"	WH/BK-GR



**US ARMY**  
**CORPS OF ENGINEERS, NEW YORK DISTRICT**



Greenbrook Sub-Basin of the Raritan River  
Greenbrook Flood Control Project  
Segment U

Borough of Bound Brook  
New Jersey

CONTRACTOR:  
FUNDED BY: FEDERAL    %, LOCAL    %  
COMPLETION DATE:

**FOR YOUR SAFETY**

1. ~~DO NOT ENTER DESIGNATED WORK AREA,~~  
EXCEPT FOR LOCAL RESIDENTS.
2. OBEY ALL STATE AND LOCAL REGULATIONS  
CONCERNING PROHIBITED ACTIVITIES

DISTRICT ENGINEER COL. JOHN B. O'DOWD

RED CASTLE

48"

RED LETTERS

48"

**PUBLIC SAFETY SIGN**



As Construction Project Identification signs and Safety Performance signs are to be fabricated and installed as described below. The signs are to be erected at a location designated by the contracting officer and shall conform to the size, format, and typographic standards shown on the attached sheets.

The sign panels are to be fabricated from .75" High Density Overlay Plywood. Panel preparation to follow HDD specifications provided in Appendix B.

Sign graphics to be prepared on a white non-reflective vinyl film with positionable adhesive backing.

All graphics except for the Communications Red background with Corps signature on the project sign are to be die-cut or computer-cut non-reflective vinyl, pre-spaced legends prepared in the sizes and typefaces specified and applied to the background panel following the graphic formats shown on the attached sheets.

The 2"x4" Communications Red panel (to match PMS-032) with full Corps signature (reverse version) is to be screen printed on the white background. Identification of the District or Division may be applied under the signature with white cut vinyl letters prepared to Corps standards. Large scale reproduction artwork for the signature is provided on page 4.3 (photographically enlarge from 6.375" to 10.5").

Drill and insert six (6) .375" T-nuts from the front face of the HDD sign panel. Position holes as shown. Flange of T-nut to be flush with sign face.

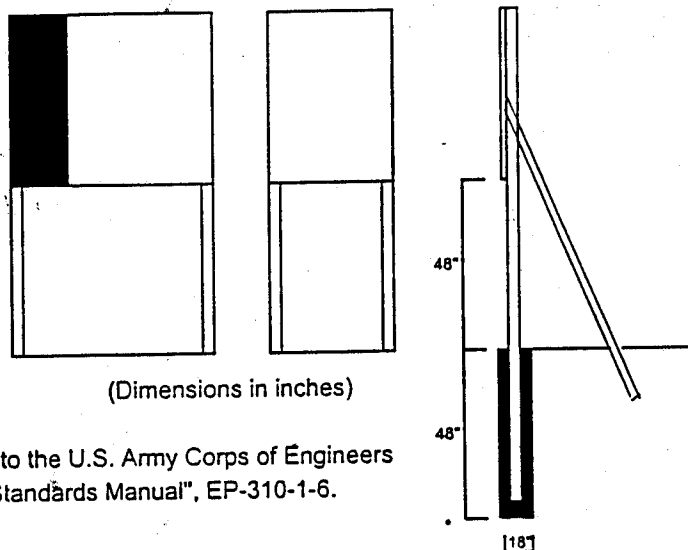
Apply graphic panel to prepared HDD plywood panel following manufacturers' instructions.

Sign uprights to be structural grade 4"x4" treated Douglas Fir or Southern Yellow Pine, No.1 or better. Post to be 12" long. Drill six (6) .375" mounting holes in uprights to align with T-nuts in sign panel. Countersink (.5") back of hole to accept socket head cap screw (4"x.375").

Assemble sign panel and uprights. Embed assembled sign panel and uprights in 4" hole. Local soil conditions and/or wind loading may require bolting additional 2"x4" struts on inside face of uprights to reinforce installation as shown.

Detailed specifications for HDD plywood panel preparation are provided in Appendix B.

Shown below the mounting diagram is a panel layout grid with spaces provided for project information. Photocopy this page and use as a worksheet when preparing sign legend orders.



\*\* Refers to the U.S. Army Corps of Engineers "Sign Standards Manual", EP-310-1-6.

#### Construction Project Sign Legend Group 1: Corps Relationship

1. \_\_\_\_\_
2. \_\_\_\_\_

#### Legend Group 2: Division/District Name

1. \_\_\_\_\_
2. \_\_\_\_\_

#### Legend Group 3: Project Title

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

#### Legend Group 4: Facility Name

1. \_\_\_\_\_
2. \_\_\_\_\_

#### Legend Group 5a: Contractor/A&E

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

#### Legend Group 5b: Contractor /A&E

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

#### Safety Performance Sign Legend Group 1: Project Title

1. \_\_\_\_\_
2. \_\_\_\_\_

#### Legend Group 2: Contractor/A&E

1. \_\_\_\_\_
2. \_\_\_\_\_

## Section 00900 - WAGE RATES

**WAGE DETERMINATION NO: 94-2349 REV (19) AREA: NJ,MIDDLESEX**

WAGE DETERMINATION NO: 94-2349 REV (19) AREA: NJ,MIDDLESEX

REGISTER OF WAGE DETERMINATIONS UNDER

U.S. DEPARTMENT OF LABOR

\*\*\*FOR OFFICIAL USE ONLY BY FEDERAL AGENCIES PARTICIPATING IN MOU WITH DOL\*\*\*

WASHINGTON D.C. 20210

William W.Gross  
DirectorDivision of  
Wage Determinations

Wage Determination No.: 1994-2349

Revision No.: 19

Date Of Last Revision: 06/05/2003

State: **New Jersey**Area: **New Jersey** Counties of Hunterdon, Middlesex, **Somerset**, Warren

\*\*Fringe Benefits Required Follow the Occupational Listing\*\*

## OCCUPATION CODE - TITLE

## MINIMUM WAGE RATE

## 01000 - Administrative Support and Clerical Occupations

01011 - Accounting Clerk I	10.60
01012 - Accounting Clerk II	14.07
01013 - Accounting Clerk III	15.32
01014 - Accounting Clerk IV	17.63
01030 - Court Reporter	17.51
01050 - Dispatcher, Motor Vehicle	16.53
01060 - Document Preparation Clerk	13.81
01070 - Messenger (Courier)	10.20
01090 - Duplicating Machine Operator	12.97
01110 - Film/Tape Librarian	15.22
01115 - General Clerk I	8.16
01116 - General Clerk II	11.53
01117 - General Clerk III	12.83
01118 - General Clerk IV	16.71
01120 - Housing Referral Assistant	19.92
01131 - Key Entry Operator I	12.28
01132 - Key Entry Operator II	13.07
01191 - Order Clerk I	14.34
01192 - Order Clerk II	18.67
01261 - Personnel Assistant (Employment) I	12.79
01262 - Personnel Assistant (Employment) II	14.38
01263 - Personnel Assistant (Employment) III	18.70
01264 - Personnel Assistant (Employment) IV	20.22
01270 - Production Control Clerk	18.38
01290 - Rental Clerk	15.92
01300 - Scheduler, Maintenance	14.37

01311 - Secretary I	15.19
01312 - Secretary II	19.21
01313 - Secretary III	19.92
01314 - Secretary IV	23.33
01315 - Secretary V	25.94
01320 - Service Order Dispatcher	14.38
01341 - Stenographer I	11.98
01342 - Stenographer II	13.46
01400 - Supply <b>Technician</b>	23.33
01420 - Survey Worker (Interviewer)	14.10
01460 - Switchboard Operator-Receptionist	14.20
01510 - Test Examiner	18.70
01520 - Test Proctor	18.70
01531 - Travel Clerk I	12.64
01532 - Travel Clerk II	13.71
01533 - Travel Clerk III	14.84
01611 - Word Processor I	11.35
01612 - Word Processor II	16.94
01613 - Word Processor III	19.48
03000 - Automatic Data Processing Occupations	
03010 - Computer Data Librarian	12.94
03041 - Computer Operator I	11.89
03042 - Computer Operator II	16.86
03043 - Computer Operator III	18.99
03044 - Computer Operator IV	20.67
03045 - Computer Operator V	22.85
03071 - Computer Programmer I (1)	19.46
03072 - Computer Programmer II (1)	24.10
03073 - Computer Programmer III (1)	27.62
03074 - Computer Programmer IV (1)	27.62
03101 - Computer Systems Analyst I (1)	27.17
03102 - Computer Systems Analyst II (1)	27.62
03103 - Computer Systems Analyst III (1)	27.62
03160 - Peripheral Equipment Operator	12.05
05000 - Automotive Service Occupations	
05005 - Automotive Body Repairer, Fiberglass	21.01
05010 - Automotive Glass Installer	22.58
05040 - Automotive Worker	22.58
05070 - Electrician, Automotive	23.56
05100 - Mobile Equipment Servicer	20.74
05130 - Motor Equipment Metal Mechanic	24.48
05160 - Motor Equipment Metal Worker	22.58
05190 - Motor Vehicle Mechanic	24.48
05220 - Motor Vehicle Mechanic Helper	19.78
05250 - Motor Vehicle Upholstery Worker	21.67
05280 - Motor Vehicle Wrecker	22.58
05310 - Painter, Automotive	23.56
05340 - Radiator Repair Specialist	22.58
05370 - Tire Repairer	17.20
05400 - Transmission Repair Specialist	24.48
07000 - Food Preparation and Service Occupations	
(not set) - Food Service Worker	9.94
07010 - Baker	13.18

07041 - Cook I	11.46
07042 - Cook II	13.13
07070 - Dishwasher	9.04
07130 - Meat Cutter	15.95
07250 - Waiter/Waitress	10.54
09000 - Furniture Maintenance and Repair Occupations	
09010 - Electrostatic Spray Painter	20.16
09040 - Furniture Handler	15.94
09070 - Furniture Refinisher	20.16
09100 - Furniture Refinisher Helper	16.92
09110 - Furniture Repairer, Minor	18.54
09130 - Upholsterer	20.16
11030 - General Services and Support Occupations	
11030 - Cleaner, Vehicles	9.41
11060 - Elevator Operator	11.44
11090 - Gardener	13.16
11121 - House Keeping Aid I	8.87
11122 - House Keeping Aid II	9.40
11150 - Janitor	11.44
11210 - Laborer, Grounds Maintenance	11.82
11240 - Maid or Houseman	10.70
11270 - Pest Controller	14.98
11300 - Refuse Collector	12.58
11330 - Tractor Operator	13.38
11360 - Window Cleaner	11.44
12000 - Health Occupations	
12020 - Dental Assistant	14.89
12040 - Emergency Medical <b>Technician</b> (EMT)/Paramedic/Ambulance Driver	13.35
12071 - Licensed Practical Nurse I	12.72
12072 - Licensed Practical Nurse II	14.28
12073 - Licensed Practical Nurse III	15.97
12100 - Medical Assistant	13.22
12130 - Medical Laboratory <b>Technician</b>	14.28
12160 - Medical Record Clerk	11.57
12190 - Medical Record <b>Technician</b>	14.92
12221 - Nursing Assistant I	7.61
12222 - Nursing Assistant II	8.56
12223 - Nursing Assistant III	9.83
12224 - Nursing Assistant IV	10.91
12250 - Pharmacy <b>Technician</b>	12.79
12280 - Phlebotomist	13.26
12311 - Registered Nurse I	19.78
12312 - Registered Nurse II	24.20
12313 - Registered Nurse II, Specialist	24.20
12314 - Registered Nurse III	33.26
12315 - Registered Nurse III, Anesthetist	33.26
12316 - Registered Nurse IV	39.85
13000 - Information and Arts Occupations	
13002 - Audiovisual Librarian	20.61
13011 - Exhibits Specialist I	14.51
13012 - Exhibits Specialist II	17.04
13013 - Exhibits Specialist III	18.28
13041 - Illustrator I	14.51

13042 - Illustrator II	17.04
13043 - Illustrator III	18.28
13047 - Librarian	26.42
13050 - Library <b>Technician</b>	13.60
13071 - Photographer I	13.64
13072 - Photographer II	16.02
13073 - Photographer III	17.19
13074 - Photographer IV	21.77
13075 - Photographer V	23.68
15000 - Laundry, Dry Cleaning, Pressing and Related Occupations	
15010 - Assembler	8.42
15030 - Counter Attendant	8.42
15040 - Dry Cleaner	10.81
15070 - Finisher, Flatwork, Machine	8.42
15090 - Presser, Hand	8.42
15100 - Presser, Machine, Drycleaning	8.42
15130 - Presser, Machine, Shirts	8.42
15160 - Presser, Machine, Wearing Apparel, Laundry	8.42
15190 - Sewing Machine Operator	11.57
15220 - Tailor	12.33
15250 - Washer, Machine	11.03
19000 - Machine Tool Operation and Repair Occupations	
19010 - Machine-Tool Operator (Toolroom)	18.93
19040 - Tool and Die Maker	24.21
21000 - Material Handling and Packing Occupations	
21010 - Fuel Distribution System Operator	19.09
21020 - Material Coordinator	17.90
21030 - Material Expediter	17.89
21040 - Material Handling Laborer	11.78
21050 - Order Filler	11.56
21071 - Forklift Operator	15.33
21080 - Production Line Worker (Food Processing)	15.33
21100 - Shipping/Receiving Clerk	12.89
21130 - Shipping Packer	11.03
21140 - Store Worker I	11.69
21150 - Stock Clerk (Shelf Stocker; Store Worker II)	14.60
21210 - Tools and Parts Attendant	15.55
21400 - Warehouse Specialist	16.53
23000 - Mechanics and Maintenance and Repair Occupations	
23010 - Aircraft Mechanic	20.95
23040 - Aircraft Mechanic Helper	16.92
23050 - Aircraft Quality Control Inspector	21.77
23060 - Aircraft Servicer	18.54
23070 - Aircraft Worker	19.34
23100 - Appliance Mechanic	22.18
23120 - Bicycle Repairer	17.14
23125 - Cable Splicer	27.76
23130 - Carpenter, Maintenance	25.50
23140 - Carpet Layer	19.95
23160 - Electrician, Maintenance	25.43
23181 - Electronics <b>Technician</b> , Maintenance I	19.70
23182 - Electronics <b>Technician</b> , Maintenance II	20.55
23183 - Electronics <b>Technician</b> , Maintenance III	21.41

23260 - Fabric Worker	19.15
23290 - Fire Alarm System Mechanic	21.63
23310 - Fire Extinguisher Repairer	18.22
23340 - Fuel Distribution System Mechanic	22.55
23370 - General Maintenance Worker	19.34
23400 - Heating, Refrigeration and Air Conditioning Mechanic	20.95
23430 - Heavy Equipment Mechanic	20.95
23440 - Heavy Equipment Operator	25.36
23460 - Instrument Mechanic	21.63
23470 - Laborer	13.40
23500 - Locksmith	20.16
23530 - Machinery Maintenance Mechanic	19.37
23550 - Machinist, Maintenance	19.98
23580 - Maintenance Trades Helper	15.08
23640 - Millwright	27.93
23700 - Office Appliance Repairer	22.16
23740 - Painter, Aircraft	24.10
23760 - Painter, Maintenance	23.18
23790 - Pipefitter, Maintenance	24.67
23800 - Plumber, Maintenance	22.88
23820 - Pneudraulic Systems Mechanic	21.63
23850 - Rigger	21.63
23870 - Scale Mechanic	19.95
23890 - Sheet-Metal Worker, Maintenance	20.95
23910 - Small Engine Mechanic	19.34
23930 - Telecommunication Mechanic I	20.95
23931 - Telecommunication Mechanic II	21.77
23950 - Telephone Lineman	20.95
23960 - Welder, Combination, Maintenance	20.92
23965 - Well Driller	22.97
23970 - Woodcraft Worker	21.63
23980 - Woodworker	19.51
24000 - Personal Needs Occupations	
24570 - Child Care Attendant	12.16
24580 - Child Care Center Clerk	15.01
24600 - Chore Aid	9.74
24630 - Homemaker	17.87
25000 - Plant and System Operation Occupations	
25010 - Boiler Tender	22.62
25040 - Sewage Plant Operator	23.08
25070 - Stationary Engineer	22.62
25190 - Ventilation Equipment Tender	17.15
25210 - Water Treatment Plant Operator	25.15
27000 - Protective Service Occupations	
(not set) - Police Officer	25.95
27004 - Alarm Monitor	14.20
27006 - Corrections Officer	24.11
27010 - Court Security Officer	25.03
27040 - Detention Officer	24.11
27070 - Firefighter	25.49
27101 - Guard I	10.63
27102 - Guard II	11.91
28000 - Stevedoring/Longshoremen Occupations	

28010 - Blocker and Bracer	18.03
28020 - Hatch Tender	18.03
28030 - Line Handler	18.03
28040 - Stevedore I	14.25
28050 - Stevedore II	15.56
29000 - Technical Occupations	
21150 - Graphic Artist	21.46
29010 - Air Traffic Control Specialist, Center (2)	30.86
29011 - Air Traffic Control Specialist, Station (2)	21.27
29012 - Air Traffic Control Specialist, Terminal (2)	23.44
29023 - Archeological <b>Technician I</b>	12.25
29024 - Archeological <b>Technician II</b>	13.81
29025 - Archeological <b>Technician III</b>	17.04
29030 - Cartographic <b>Technician</b>	17.81
29035 - Computer Based Training (CBT) Specialist/ Instructor	27.17
29040 - Civil Engineering <b>Technician</b>	17.03
29061 - Drafter I	9.11
29062 - Drafter II	10.57
29063 - Drafter III	14.51
29064 - Drafter IV	17.04
29081 - Engineering <b>Technician I</b>	11.90
29082 - Engineering <b>Technician II</b>	13.81
29083 - Engineering <b>Technician III</b>	18.95
29084 - Engineering <b>Technician IV</b>	22.24
29085 - Engineering <b>Technician V</b>	27.19
29086 - Engineering <b>Technician VI</b>	32.89
29090 - Environmental <b>Technician</b>	20.46
29100 - Flight Simulator/Instructor (Pilot)	30.38
29160 - Instructor	23.62
29210 - Laboratory <b>Technician</b>	18.43
29240 - Mathematical <b>Technician</b>	17.04
29361 - Paralegal/Legal Assistant I	14.71
29362 - Paralegal/Legal Assistant II	20.76
29363 - Paralegal/Legal Assistant III	25.33
29364 - Paralegal/Legal Assistant IV	30.72
29390 - Photooptics <b>Technician</b>	18.41
29480 - Technical Writer	32.37
29491 - Unexploded Ordnance (UXO) <b>Technician I</b>	19.61
29492 - Unexploded Ordnance (UXO) <b>Technician II</b>	23.73
29493 - Unexploded Ordnance (UXO) <b>Technician III</b>	28.44
29494 - Unexploded (UXO) Safety Escort	19.61
29495 - Unexploded (UXO) Sweep Personnel	19.61
29620 - Weather Observer, Senior (3)	19.95
29621 - Weather Observer, Combined Upper Air and Surface Programs (3)	17.94
29622 - Weather Observer, Upper Air (3)	17.94
31000 - Transportation/ Mobile Equipment Operation Occupations	
31030 - Bus Driver	15.07
31260 - Parking and Lot Attendant	8.83
31290 - Shuttle Bus Driver	13.68
31300 - Taxi Driver	11.76
31361 - Truckdriver, Light Truck	13.68
31362 - Truckdriver, Medium Truck	16.45
31363 - Truckdriver, Heavy Truck	22.57

31364 - Truckdriver, Tractor-Trailer	22.57
99000 - Miscellaneous Occupations	
99020 - Animal Caretaker	8.62
99030 - Cashier	9.82
99041 - Carnival Equipment Operator	11.86
99042 - Carnival Equipment Repairer	12.36
99043 - Carnival Worker	10.14
99050 - Desk Clerk	12.05
99095 - Embalmer	20.92
99300 - Lifeguard	10.31
99310 - Mortician	19.13
99350 - Park Attendant (Aide)	12.94
99400 - Photofinishing Worker (Photo Lab Tech., Darkroom Tech)	10.78
99500 - Recreation Specialist	13.79
99510 - Recycling Worker	14.66
99610 - Sales Clerk	11.33
99620 - School Crossing Guard (Crosswalk Attendant)	10.68
99630 - Sport Official	10.31
99658 - Survey Party Chief (Chief of Party)	15.83
99659 - Surveying <b>Technician</b> (Instr. Person/Surveyor Asst./Instr.)	13.17
99660 - Surveying Aide	9.60
99690 - Swimming Pool Operator	7.93
99720 - Vending Machine Attendant	7.71
99730 - Vending Machine Repairer	10.19
99740 - Vending Machine Repairer Helper	8.38

ALL OCCUPATIONS LISTED ABOVE RECEIVE THE FOLLOWING BENEFITS:

HEALTH & WELFARE: \$2.36 an hour or \$94.40 a week or \$409.07 a month

VACATION: 2 weeks paid vacation after 1 year of service with a contractor or successor; 3 weeks after 5 years, and 4 weeks after 15 years. Length of service includes the whole span of continuous service with the present contractor or successor, wherever employed, and with the predecessor contractors in the performance of similar work at the same Federal facility. (Reg. 29 CFR 4.173)

HOLIDAYS: A minimum of eleven paid holidays per year: **New** Year's Day, Martin Luther King Jr's Birthday, Washington's Birthday, Good Friday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day, and Christmas Day. A contractor may substitute for any of the named holidays another day off with pay in accordance with a plan communicated to the employees involved.)

(See 29 CFR 4.174)

THE OCCUPATIONS WHICH HAVE PARENTHESES AFTER THEM RECEIVE THE FOLLOWING BENEFITS (as numbered):

1) Does not apply to employees employed in a bona fide executive, administrative, or professional capacity as defined and delineated in 29 CFR 541. (See CFR 4.156)



2) APPLICABLE TO AIR TRAFFIC CONTROLLERS ONLY - NIGHT DIFFERENTIAL: An employee is entitled to pay for all work performed between the hours of 6:00 P.M. and 6:00 A.M. at the rate of basic pay plus a night pay differential amounting to 10 percent of the rate of basic pay.

3) WEATHER OBSERVERS - NIGHT PAY & SUNDAY PAY: If you work at night as part of a regular tour of duty, you will earn a night differential and receive an additional 10% of basic pay for any hours worked between 6pm and 6am. If you are a full-time employed (40 hours a week) and Sunday is part of your regularly scheduled workweek, you are paid at your rate of basic pay plus a Sunday premium of 25% of your basic rate for each hour of Sunday work which is not overtime (i.e. occasional work on Sunday outside the normal tour of duty is considered overtime work).

HAZARDOUS PAY DIFFERENTIAL: An 8 percent differential is applicable to employees employed in a position that represents a high degree of hazard when working with or in close proximity to ordnance, explosives, and incendiary materials. This includes work such as screening, blending, dying, mixing, and pressing of sensitive ordnance, explosives, and pyrotechnic compositions such as lead azide, black powder and photoflash powder. All dry-house activities involving propellants or explosives. Demilitarization, modification, renovation, demolition, and maintenance operations on sensitive ordnance, explosives and incendiary materials. All operations involving regrading and cleaning of artillery ranges.

A 4 percent differential is applicable to employees employed in a position that represents a low degree of hazard when working with, or in close proximity to ordnance, (or employees possibly adjacent to) explosives and incendiary materials which involves potential injury such as laceration of hands, face, or arms of the employee engaged in the operation, irritation of the skin, minor burns and the like; minimal damage to immediate or adjacent work area or equipment being used. All operations involving, unloading, storage, and hauling of ordnance, explosive, and incendiary ordnance material other than small arms ammunition. These differentials are only applicable to work that has been specifically designated by the agency for ordnance, explosives, and incendiary material differential pay.

#### \*\* UNIFORM ALLOWANCE \*\*

If employees are required to wear uniforms in the performance of this contract (either by the terms of the Government contract, by the employer, by the state or local law, etc.), the cost of furnishing such uniforms and maintaining (by laundering or dry cleaning) such uniforms is an expense that may not be borne by an employee where such cost reduces the hourly rate below that required by the wage determination. The Department of Labor will accept payment in accordance with the following standards as compliance:

The contractor or subcontractor is required to furnish all employees with an adequate number of uniforms without cost or to reimburse employees for the actual cost of the uniforms. In addition, where uniform cleaning and maintenance is made the responsibility of the employee, all contractors and subcontractors subject to this wage determination shall (in the absence of a bona fide collective bargaining agreement providing for a different amount, or the furnishing of contrary affirmative proof as to the actual cost), reimburse

all employees for such cleaning and maintenance at a rate of \$3.35 per week (or \$.67 cents per day). However, in those instances where the uniforms furnished are made of "wash and wear" materials, may be routinely washed and dried with other personal garments, and do not require any special treatment such as dry cleaning, daily washing, or commercial laundering in order to meet the cleanliness or appearance standards set by the terms of the Government contract, by the contractor, by law, or by the nature of the work, there is no requirement that employees be reimbursed for uniform maintenance costs.

\*\* NOTES APPLYING TO THIS WAGE DETERMINATION \*\*

Source of Occupational Title and Descriptions:

The duties of employees under job titles listed are those described in the "Service Contract Act Directory of Occupations," Fourth Edition, January 1993, as amended by the Third Supplement, dated March 1997, unless otherwise indicated. This publication may be obtained from the Superintendent of Documents, at 202-783-3238, or by writing to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Copies of specific job descriptions may also be obtained from the appropriate contracting officer.

REQUEST FOR AUTHORIZATION OF ADDITIONAL CLASSIFICATION AND WAGE RATE {Standard Form 1444 (SF 1444)}

Conformance Process:

The contracting officer shall require that any class of service employee which is not listed herein and which is to be employed under the contract (i.e., the work to be performed is not performed by any classification listed in the wage determination), be classified by the contractor so as to provide a reasonable relationship (i.e., appropriate level of skill comparison) between such unlisted classifications and the classifications listed in the wage determination. Such conformed classes of employees shall be paid the monetary wages and furnished the fringe benefits as are determined. Such conforming process shall be initiated by the contractor prior to the performance of contract work by such unlisted class(es) of employees. The conformed classification, wage rate, and/or fringe benefits shall be retroactive to the commencement date of the contract. {See Section 4.6 (C)(vi)} When multiple wage determinations are included in a contract, a separate SF 1444 should be prepared for each wage determination to which a class(es) is to be conformed.

The process for preparing a conformance request is as follows:

- 1) When preparing the bid, the contractor identifies the need for a conformed occupation) and computes a proposed rate).
- 2) After contract award, the contractor prepares a written report listing in order proposed classification title), a Federal grade equivalency (FGE) for each proposed classification), job description), and rationale for proposed wage rate), including information regarding the agreement or disagreement of the authorized representative of the employees involved, or where there is no authorized representative, the employees themselves. This report should be submitted to the contracting officer no later than 30 days after such unlisted class(es) of employees performs any contract work.

3) The contracting officer reviews the proposed action and promptly submits a report of the action, together with the agency's recommendations and pertinent information including the position of the contractor and the employees, to the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, for review. (See section 4.6(b)(2) of Regulations 29 CFR Part 4).

4) Within 30 days of receipt, the Wage and Hour Division approves, modifies, or disapproves the action via transmittal to the agency contracting officer, or notifies the contracting officer that additional time will be required to process the request.

5) The contracting officer transmits the Wage and Hour decision to the contractor.

6) The contractor informs the affected employees.

Information required by the Regulations must be submitted on SF 1444 or bond paper.

When preparing a conformance request, the "Service Contract Act Directory of Occupations" (the Directory) should be used to compare job definitions to insure that duties requested are not performed by a classification already listed in the wage determination. Remember, it is not the job title, but the required tasks that determine whether a class is included in an established wage determination. Conformances may not be used to artificially split, combine, or subdivide classifications listed in the wage determination.

GENERAL DECISION **NJ030003** 06/13/2003 NJ3

Date: June 13, 2003 sg 7/31/03  
General Decision Number **NJ030003**

Superseded General Decision No. NJ020003

State: New Jersey

Construction Type:  
BUILDING

**HEAVY** This project is classified as HEAVY construction  
HIGHWAY

County(ies):

BERGEN	MIDDLESEX	SUSSEX
ESSEX	MORRIS	UNION
HUDSON	PASSAIC	WARREN
HUNTERDON	<b>SOMERSET</b>	

BUILDING CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories, does not include Hunterdon or Somerset Counties for building construction only)

HEAVY AND HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	06/13/2003

COUNTY(ies):

BERGEN	MIDDLESEX	SUSSEX
ESSEX	MORRIS	UNION
HUDSON	PASSAIC	WARREN
HUNTERDON	<b>SOMERSET</b>	

ASBE0032E 09/19/2001

Rates Fringes

BERGEN, ESSEX, HUDSON, HUNTERDON (Remainder), MIDDLESEX (Remainder), MORRIS, PASSIAC, SOMERSET (Remainder), SUSSEX, UNION, & WARREN (Remainder) COUNTIES:

ASBESTOS WORKERS/INSULATORS

Includes the application of all

insulating materials; protective  
coverings, coatings, and finishes  
to all types of mechanical systems 30.62 18.16

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ASBE0089A 07/01/2002

Rates Fringes

HUNTERDON (Alexander, Bethlehem, Bloomsbury, Clinton, Delaware, East Armwell, Flemington, Franklin, Frenchtown, Glen Garden, Hampton, High Bridge, Holland, Kingwood, Lambertville, Lebanon, Milford, Raritan, Readington, Stockton, Union, and West Armwell Twps), MIDDLESEX (Cranbury, East Brunswick, Helmburg, Jamesburg, Milltown, Monroe, North Brunswick, Plainsboro, South Brunswick, and Spotswood Twps), SOMERSET (Branchburg, Franklin, Hillsborough, Manville, Millstone, Montgomery and Rocky Hill Twps), AND WARREN (Franklin, Greenwich, Hamony, Lopatcong, Oxford, Phillipsburg, Washington, and White Twps) COUNTIES

#### ASBESTOS WORKERS/INSULATORS

Includes the application of all  
insulating materials, protective  
coverings, coatings, and finishes  
to all types of mechanical systems 29.78 15.97

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BOIL0028A 01/01/2002

Rates Fringes

BOILERMAKER 32.03 44%+4.61

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BRNJ0004D 11/01/2001

Rates Fringes

BERGEN, ESSEX, HUDSON, MORRIS, PASSAIC, SUSSEX, UNION, WARREN, the following parts of HUNTERDON, and SOMERSET COUNTIES: (at Old Mill Inn Route #202 follow Passaic River to the Dean River from thence to Sunset Lake at Pluckemin, follow Chambers Brook to Oldwick to Fairmount, Hunterdon County across the county line to Long Valley in Morris County, thence across

from Long Valley into Chester, three miles North of Chester to Muskrat, then back across into Ralston, Morris County, then follow Morris-Somerset County line into Mendham Township, then across Morris County line into Somerset, back to the Old Mill Inn in Bernardsville, Route #202, Somerset County)

BRICKLAYERS, CEMENT MASONS,  
PLASTERERS, & STONEMASONS 29.22 13.70

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BRNJ0005B 11/01/2000

Rates Fringes

HUNTERDON (Annadale,Califon,Lebanon,Oldwick,Readington,  
Three Bridges,& White House Station Twps.),MIDDLESEX (except  
Dunellen, Middlesex, Oak Tree, New Market, and South Plainfield  
Twps), AND SOMERSET (Remainer) COUNTIES

BRICKLAYERS, CEMENT MASONS, PLASTERERS & STONEMASONS	27.85	12.70
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CARP0006B 05/01/2003

Rates Fringes

BERGEN (East of Hackensack River including but not limited to  
Cliffside, Coytesville, Edgewater, Fairview, Fort Lee, Grant  
Wood, Leonia, Palisades Park, and Ridgefield Twps), AND HUDSON  
(East of the Hackensack River) COUNTIES

CARPENTER	31.92	13.73
MILLWRIGHTS	31.92	13.73

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CARP0015B 05/01/2003

Rates Fringes

BERGEN COUNTY (Remainder)

CARPENTERS	31.92	13.73
MILLWRIGHTS	31.92	13.73

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CARP0031C 05/01/2003

Rates Fringes

HUNTERDON (Starting at the South of the town of Frenchtown on the  
Delaware River, thence following the line in the center of the  
road to Bapistown to Croton to the City of Flemington to  
Flemington Junction to Three Bridges, tehnce following the  
Somerset County line Northward, all territory South of this line  
including the City of Flemington) AND SOMERSET (all territory  
South of a line beginning at Armwell on the County line to Zion  
to Fairview to Dutchtown to Plainsville to Bell Mead to  
Griggstown to the Delaware and Raritan Canal) COUNTIES

CARPENTERS	31.92	13.73
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CARP0041C 05/01/2003

Rates Fringes

ESSEX (Millburn Twp), MIDDLESEX, MORRIS, SOMERSET (Municipalities  
of Greenbrook, North Plainfield, Watchung, and all communities  
East of King George's Road), SUSSEX AND UNION COUNTIES

CARPENTERS & INSULATORS	31.92	13.73
MILLWRIGHTS	31.92	13.73

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CARP0099I 05/01/2003

	Rates	Fringes
LATHERS	31.92	13.73

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CARP0124A 05/01/2003

	Rates	Fringes
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BERGEN (City of Garfield and Boroughs of Lodi and Wallington),  
AND PASSAIC COUNTIES

CARPENTERS	31.92	13.73
MILLWRIGHTS	31.92	13.73

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CARP0399A 05/01/2003

	Rates	Fringes
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WARREN COUNTY

CARPENTERS & INSULATORS	31.92	13.73
MILLWRIGHTS	31.92	13.73

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CARP1342A 05/01/2003

	Rates	Fringes
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ESSEX, AND HUDSON (West of Hackensack River)

CARPENTERS	31.92	13.73
MILLWRIGHTS	31.92	13.73

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CARP1456A 05/01/2001

	Rates	Fringes
DIVER	37.13	23.56
DIVER TENDER	27.67	23.56

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CARP1456B 05/01/2001

	Rates	Fringes
DOCK BUILDER & PILED RIVERMEN	30.39	23.56

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CARP2212A 05/01/2003

	Rates	Fringes
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BERGEN, ESSEX, HUDSON, & PASSAIC COUNTIES

SOFT FLOOR LAYERS	31.92	13.73
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ELEC0017A 07/01/1994

	Rates	Fringes
ELECTRICIANS (RAILROAD CONSTRUCTION)	21.20	26.5%

COMMERCIAL TELEPHONE INSTALLATION	21.20	26.5%
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ELEC0102B 06/03/2002

	Rates	Fringes
MORRIS, PASSAIC, SUSSEX, UNION, AND WARREN COUNTIES		

LINE CONSTRUCTION:

Lineman & Equipment Operators	36.80	37%
Cable Splicers	40.48	37%
Groundmen	22.08	37%

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ELEC0102C 06/03/2002

	Rates	Fringes
MORRIS, PASSAIC, SUSSEX, UNION, AND WARREN COUNTIES		

ELECTRICIAN	36.26	39.75%
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CABLE SPLICER	39.88	39.75%
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ELEC0164B 08/15/2000

	Rates	Fringes
BERGEN, ESSEX, AND HUDSON COUNTIES		

LINE CONSTRUCTION:

Lineman, Welder, X-Ray Technician, Equipment Repairman, & Equipment Serviceman	34.42	41%
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Cable Splicer	38.89	41%
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Groundman	20.66	41%
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ELEC0164C 06/03/2002

	Rates	Fringes
BERGEN, ESSEX, AND HUDSON COUNTIES		

ELECTRICIANS	36.90	42%
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CABLE SPLICERS	41.70	42%
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ELEC0262B 08/15/1993

Rates	Fringes
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MIDDLESEX COUNTY (Area North and West of a line following the

Philadelphia and Reading Railroad East from the Raritan River to Dismal Road, Northeast on Dismal Road to Park Avenue, North on Park Avenue to Lehigh Valley Railroad, and Northeast along that railroad to the Union County line)

ELECTRICIANS	25.92	6.09+20%
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ELEC0262H 11/30/1994

Rates	Fringes
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MIDDLESEX COUNTY (Area North and West of a line following the Philadelphia and Reading Railroad East from the Raritan River to Dismal Road, Northeast on Dismal Road to Park Avenue, North on Park Avenue to the Lehigh Valley Railroad, and Northeast along that railroad to the Union County line)

## LINE CONSTRUCTION:

Linemen, Cable Splicers	22.87	3.76+11.7%
Groundmen	21.06	3.76+11.7%

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ELEC0358A 06/01/1998

Rates	Fringes
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MIDDLESEX COUNTY (Remainder)

ELECTRICIANS	30.26	42.75%
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ELEC0358C 06/01/1998

Rates	Fringes
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MIDDLESEX COUNTY (Remainder)

## LINE CONSTRUCTION:

Linemen, Hole Digger Operator,  
Truck w/o Winch or Pole & Steel  
Hand, Truck w/o Winch, X-ray  
Technician & Equip. Repairer

30.26	43%
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Cable Splicer	33.89	43%
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Groundman & Winch Operator	29.47	43%
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Certified Welder Lineman	31.77	43%
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ELEC0456B 06/03/2002

Rates Fringes

MIDDLESEX COUNTY (Area South and West of a line extending East from the Raritan River along the Philadelphia and Reading Railroad to Shelton Rd, South on Shelton Rd to Lincoln Hwy to Vineyard Rd to Old Post Rd, along Old Post Rd to Mill Rd, along Mill Rd to the Raritan River, along the Raritan River to South River, along South River to the Southern boundary of the Borough of South River, along this boundary to Cranbury South River Turnpike, along this road continuing on to Washington Rd and

Maplewood Ave in Cranbury to Scott Ave, along Scott Ave to Main St, on Main St and the turnpike to Millstone River)

ELECTRICIANS	34.77	45.75%
CABLE SPLICERS	38.94	45.75%

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ELEC0456C 06/03/2002

Rates Fringes

MIDDLESEX COUNTY (Area South and West of a line extending East from the Raritan River along the Philadelphia and Reading Railroad to Shelton Rd, South on Shelton Rd to Lincoln Hwy to Vineyard Rd to Old Post Rd, along Old Post Rd to Mill Rd, along Mill Rd, along Mill Rd to the Raritan River, along Raritan River to South River, along South River to the Southern boundary of the Borough of South River, along this boundary to the Cranbury South River Turnpike, along this road continuing on to Washington Rd and Maplewood Ave in Cranbury to Scott Ave, along Scott Ave to Main St, on Main St and the turnpike to Millstone River)

## LINE CONSTRUCTION:

Linemen	34.77	45.75%
Cable Splicer	38.95	45.75%
Groundmen	33.98	45.75%
Winch Operator	33.98	45.75%

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ELEV0001A 07/01/1994

Rates Fringes

## ELEVATOR MECHANICS:

Construction	22.59	5.22+A+B+C
Modernization	15.94	3.69+A+B+C

## FOOTNOTES:

- A. PAID HOLIDAYS: New Year's Day, Lincoln's Birthday, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veteran's Day, Election Day, Thanksgiving Day, and Christmas Day
- B. Employer contributes \$8.00 per day per employee to annuity fund
- C. Employee with 6 months but less than 5 years of service receive 2 weeks vacation, and 3 weeks vacation for

5 years or more of service

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ENGI0825C 07/01/2002

	Rates	Fringes
POWER EQUIPMENT OPERATORS		
TANK ERECTION:		

GROUP 1	35.36	17.15+A+B
GROUP 2	34.52	17.15+A+B
GROUP 3	36.50	17.15+A+B
GROUP 4	32.43	17.15+A+B
GROUP 5	27.22	17.15+A+B

FOOTNOTES:

- A. PAID HOLIDAYS: New Year's Day; Washington's Birthday  
Memorial Day; Independence Day; Labor Day; Veteran's Day,  
Thanksgiving Day; and Christmas Day.
- B. Employee receives 20% premium pay for hazardous waste work.

TANK ERECTION CLASSIFICATIONS

GROUP 1: Operating Engineers--on all Cranes, derricks, etc.  
with booms including jib 140 ft. or more above the ground.

GROUP 2: Operating Engineers--on all equipment, including  
cranes derricks, etc. with booms including jib, less than 140  
ft. above the ground.

GROUP 3: Helicopters--Pilot.

GROUP 4: Air compressors, welding machines and generators (gas,  
diesel, or electrical driven equipment and sources of power from  
a permanent plant, i.e., steam, compressed air, hydraulic or  
other power, for the operating of any machine or automatic tools  
used in the erection, alteration, repair and dismantling of  
tanks and any and all "DUAL PURPOSE" trucks used on the  
construction job site.

GROUP 5: Oiler.

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ENGI0825D 07/01/2002

	Rates	Fringes
POWER EQUIPMENT OPERATORS:		
[STEEL ERECTION]:		

GROUP 1	34.64	17.15+A+B
GROUP 2	34.73	17.15+A+B
GROUP 3	32.34	17.15+A+B
GROUP 4	29.78	17.15+A+B
GROUP 5	28.25	17.15+A+B

GROUP 6	26.49	17.15+A+B
GROUP 7	37.00	17.15+A+B

FOOTNOTES:

- A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, and Christmas Day.
- B. Employees receive 20% premium pay for hazardous waste work.

POWER EQUIPMENT OPERATORS CLASSIFICATIONS  
[STEEL ERECTION]

GROUP 1: Cranes - (all cranes, land or floating with booms including job 140 ft. and over, above ground); derricks-(all

derricks, land or floating with boom including jib 140 ft. and over, above ground).

GROUP 2: Cranes - (all cranes, land or floating with booms including jib less than 140 ft. above ground); derricks (all derricks, land or floating with booms including jib, less than 140 ft. above ground).

GROUP 3: "A" frame; cherry pickers 10 tons and under; hoists; all types hoists shall also include steam, gas, diesel, electric, air hydraulic, single and double drum, concrete, brick shaft caisson, or any other similar type hoisting machines, portable or stationary, except Chicago boom type; jacks-screw air hydraulic power operated unit console type (not hand jack or pile load test type) side booms.

GROUP 4: Aerial platform used hoist; compressor, 2 or 3 in battery; elevators or house cars; conveyors and tugger hoists; fireman; forklift; generators, 2 or 3 maintenance-utility man; rod bending machine (power); welding machines--(gas or electric, 2 or 3 in battery, including diesels); captain power boats; tug master power boats.

GROUP 5: Compressor, single, welding machine, single, gas, electric converters of any type, diesel; welding system multiple (rectifier transformer type); generator, single.

GROUP 6: Oiler staddle carrier.

GROUP 7: Helicopter pilot.

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ENGI0825E 07/01/2002

Rates Fringes

POWER EQUIPMENT OPERATORS:

OILOSTATIC MAINLINES & TRANSPORTATION PIPELINES:

GROUP 1	33.50	17.15+A+B
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GROUP 2	32.85	17.15+A+B
GROUP 3	29.71	17.15+A+B
GROUP 4	28.31	17.15+A+B
GROUP 5	26.49	17.15+A+B
GROUP 6	35.43	17.15+A+B

## FOOTNOTES:

- A. PAID HOLIDAYS: New Year's Day; Washington's Birthday, Memorial Day; Independence Day; Labor Day; Veteran's Day, Thanksgiving Day; and Christmas Day
- B. Employee receives 20% premium pay for hazardous waste work.

OILOSTATIC MAINLINES AND TRANSPORTATION PIPE LINES  
CLASSIFICATIONS

GROUP 1: Backhoe; cranes (all types); draglines; front-end

loaders (5 yds. and over); gradalls; scooper (loader and shovel); koehring and trench machines.

GROUP 2: "A" frame; backhoe (combination hoe loader); boring and drilling machines; ditching machine, small; ditchwitch or similar type; fork lifts; front end loaders (2 yds and over but less than 5 yds.); graders, finish (fine); hydraulic cranes, 10 tons and under (over 10 tons - crane rate applies); side booms; and winch trucks (hoisting).

GROUP 3: Backfiller; brooms and sweepers; bulldozers; compressors (2 or 3 in battery); front-end loaders (under 2 yds.); generators; giraffe grinders; graders and motor patrols; mechanic; pipe bending machine (power); tractors; water and sprinkler trucks, welder and repair mechanic.

GROUP 4: Compressor (single); dope pots (mechanical with or without pump); dust collectors; farm tractors; pumps (4 in. suction and over); pumps (2 or less than 4 in. suction); pumps; diesel engine and hydraulic (immaterial or power); welding machines; gas or electric converters of any type, single; welding machines, gas or electric converters of any type, 2 or 3 in battery multiple welders; wellpoint systems (including installation and maintenance).

GROUP 5: Oiler, grease, gas, fuel and supply trucks and tire repair and maintenance.

GROUP 6: Helicopter-pilot.

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ENGI0825M 07/01/2002

Rates              Fringes

BUILDING CONSTRUCTION PROJECTS; HEAVY,  
HIGHWAY, ROAD, STREET AND SEWER PROJECTS:

## POWER EQUIPMENT OPERATORS

GROUP 1	32.87	17.15+A+B
GROUP 2	31.28	17.15+A+B
GROUP 3	29.37	17.15+A+B
GROUP 4	27.74	17.15+A+B
GROUP 5	26.03	17.15+A+B
GROUP 6	34.69	17.15+A+B

## FOOTNOTES:

- A. New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; Christmas Day, plus Washington's Birthday and Veterans Day.
- B. Employee receives 20% premium pay for hazardous waste work.

## POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Autograde - combination subgrader; base metal spreader

and 7 base trimmer (CMI and similar types); autograde placer, trimmer, spreader combination (CMI and similar types); autograde slipform paver (CMI and similar types); backhoe; central power plants (all types); concrete paving machines; cranes (all types, including overhead and straddle travelling type); cranes; gantry; derricks (land or floating); drillmaster, quarrymaster (down the hole drill) rotary drill; self propelled hydraulic drill; self-powered drill; dragline; elevator graders; front end loaders (5 yds. and over); gradalls; grader; raygo; locomotive (large); mucking machines; pavement and concrete breaker, i.e.; superhammer and hoe ram; pile driver; length of boom including length of leads, shall determine premium rate applicable; roadway surface grinder; scooper (loader and shovel); shovels; tree chopper with boom; trench machines.

GROUP 2: "A" frames backhoe (combination); boom attachment on loaders (rate based on size of bucket) not applicable to pipehook, boring and drilling machines; brush chopper; shredder and tree shredder; tree shedder; cableways; carryalls; concrete pump; concrete pumping system; pumpcrete and similar types; conveyors, 125 ft. and over; drill doctor including dust collector, maintenance); front end loaders (2 yds. but less than 5 yds.); graders (finisher); groove cutting machine (ride on type); header planer; hoists; (all types hoists, shall also include steam, gas, diesel, electric, air hydraulic, single and double drum, concrete brick shaft caisson, snorkel roof, and/or any other similar type hoisting machines, portable or stationary, except Chicago boom type); hoists (Chicago boom type); hydraulic cranes, 10 tons and under; hydro-axle; jacks screw air hydraulic power operated unit or console type (not hand jack or pile load test type); log skidder; pans; pavers (all concrete; pumpcrete machines; squeezecrete and concrete pumping (regardless of size); scrapers; side booms; straddle carrier; ross and similar types; winch truck (hoisting).

GROUP 3: Asphalt curbing machine; asphalt plant engineer; asphalt spreader; autograder tube finisher and texturing machine (CMI and similar types); autograde curercrete machine (CMI and similar types); autograde curb trimmer and sidewalk; shoulder; slipform (CMI and similar types); bar bending machines (power); batchers; batching plant and crusher on site; belt conveyor systems; boom type skimmer machines, bridge deck finisher; bulldozers (all); car dumpers (railroad); compressor and blower type units (used independently or mounted on dual purposes trucks, on job site or in conjunction with job site, in loading and unloading of concrete, cement, fly ash, instancrete, or similar type materials); compressor (2 or 3) (battery); concrete finishing machines; concrete saws and cutters (ride on type); concrete spreaders; hetzel; rexomatic and similar types; concrete vibrators; conveyors; under 125 ft.; crushing machines; ditching machine; small (ditchwitch or similar type); dope pots (mechanical with or without pump); dumpsters elevators fireman; fork lifts (economobile; lull and similar types of equipment); front end loaders (1 yd. and over but less than 2 yds.); generators (2 or 3) in battery; giraffe grinders; graders and motor patrols; gunnite machines (excluding nozzle); hammer

vibratory (in conjunction with generator); hoist (roof, tugger, aerial platform hoist and house cars); hoppers; Hopper doors (power operated); ladders (motorized); laddervator; locomotive; dinky type; maintenance; utility man; mechanics; mixers (except paving mixers); motor patrols and graders; pavement breakers, small; self-propelled ride on type (also maintaining compressor or hydraulic unit); pavement breaker; truck mounted; pipe bending machine (power); roller; black top; scales; power; seaman pulverizing mixer; shoulder widener; silos; skimmer machines (boom type); steel cutting machine; services and maintaining; tractors; tug captain; vibrating plants (used in conjunction with unloading); welder and repair mechanics, concrete cleaning/decontamination machine operator, directional boring machine, heavy equipment robotics operator/technician, master environmental maintenance technician, ultra high pressure waterjet cutting tool system operator/maintenance technician vacuum blasting machine operator/maintenance technician.

GROUP 4: Brooms and sweepers, chippers, compressor (single), concrete spreaders (small type), conveyor loaders (not including elevator graders), engines, large diesel (1620 H.P.) and staging pump, farm tractors; fertilizing equipment (operation and maintenance) fine grade machine (small type); form line graders (small type); front loader (under 1 yd.); generator (single); grease, gas, fuel and oil supply trucks; heaters (nelson or other type including propane, natural gas or flow-type units); lights; portable generating light plants; mixers; concrete small; mulching equipment (operation and maintenance) pumps (4 inch suction and over including submersible pumps); pumps (2 or less than 4" suction and over including submersible pumps); pumps

(diesel engine and hydraulic) immaterial of power road finishing machines (small type); rollers; grade; fill or stone base; seeding equipment (operation and maintenance of); sprinkler and water pump trucks steam jennies and biolers, stone spreader; tamping machines vibrating ride-on; temporary heating plany (nelson or other type, including propane, natural gas or flow type units); water and sprinkler trucks; welding machines (gas, diesel, and/or electric converters of any type, single; two or three in a battery); welding systems, multiple (rectifier transformer type); wellpoint systems.

GROUP 5: Oiler.

GROUP 6: Helicopter pilot.

IRON0011D 07/01/2002

	Rates	Fringes
BERGEN, ESSEX, HUDSON, HUNTERDON (Western half), MIDDLESEX (North half), MORRIS, PASSAIC, SOMERSET (North Half), SUSSEX AND UNION COUNTIES		

IRONWORKERS:

Structural	29.53	24.10
Reinforcing	27.63	24.10

IRON0036C 07/01/2002

	Rates	Fringes
WARREN COUNTY		

Projects under \$25 million:

IRONWORKERS; STRUCTURAL, REINFORCING AND ORNAMENTAL	26.60	13.52
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Projects \$25 million or more:

IRONWORKERS: STRUCTURAL, REINFORCING AND ORNAMENTAL	27.10	13.52
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IRON0068E 07/01/2002

	Rates	Fringes
HUNTERDON (Eastern half), MIDDLESEX (South half), AND SOMERSET (South half) COUNTIES		

IRONWORKERS:

Structural, Ornamental	27.91	22.35
Rerinforcing (Concrete Rods)	25.91	22.35

LABO0021C 05/01/2002

	Rates	Fringes
HUDSON COUNTEY (Remainder)		



## LABORERS BUILDING CONSTRUCTION:

Class A Laborer	22.95	11.77
Class B Laborer	22.45	11.77
Class C Laborer	19.16	11.77

Class A Laborer: Jack Hammer, Tamper, Operator of Motorized tamper and compactor, operator of hydro demolition equipment, operator of all types of motorized forklifts, operator of motor buggy, operator of conveyor, operator of bobcat, demolition burners, nozzle operator on gunnite, scaffold builder, & mortar man (except silofed).

Class B Laborer: all laborers not listed in Class A or C

Class C Laborer: Laborers doing janitorial-type light clean-up work associated with the turnover of the project or part of a project to the owner.

LABO0072B 05/01/2002

Rates                      Fringes

MIDDLESEX COUNTY (Perth Amboy, Carteret, Woodbridge, Metuchen Twps, South River, Sayreville, South Amboy, Old Bridge, East Brunswick, Spotswood, Jamesburg, Helmetta, Cranbury & Monroe Twps)

## LABORERS BUILDING CONSTRUCTION:

Class A	22.95	11.77
Class B	22.45	11.77
CLASS C	19.16	11.77

Class A-Jack Hammer, Motorized Tamper & Compactor, Street Cleaning Machines, Scaffold Builders, Hydro Demolition Equipment, all types of Motorized Fork Lifts, Riding Motor Buggy Operator, Bobcat Operator, Mortar Man, & Nozzle Man on Gunnite work.

CLASS B All Laborers not listed in Class A or C.

CLASS C Laborers doing Janitorial type light clean up work associated with the turnover of the project to the owner  
All Flagman, and those manning temporary heat of all types.

LABO0156B 05/01/2002

Rates                      Fringes

MIDDLESEX (Remainder), and SOMERSET (East Millstone and Franklin Townships) COUNTIES:

LABORERS:

Group 1	22.95	11.77
Group 2	22.45	11.77
Group 3	19.16	11.77

Group 1-Jack Hammers,Tampers,Motorized Tampers and Compactors,Street Cleaning Machines,Scaffold Builder,Hydro Demolition Equipment, all types of Motorized fork lifts riding Motor Buggy operator,Conveyor operator, Bobcat operator,Mortar Man,Burners, Nozzle man on gunite work, Mortar Man shall include all laborers engaged in any mode of mixing aggregate by hand or mechanical means with the exception of silo work.

Group 2-Basic laborer's rate and includes all work not included in Group 1 or Group 3

2.Group 3-Laborers doing janitorial-type clean-up work associated with the turnover of the project or part of a project to the owner.

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LABO0232B 05/01/2002

Rates Fringes

SOMERSET COUNTY (Bernardsville,Peapack, Gladstone, Far Hills, Bernards, and Bedminster Twps):

#### LABORERS:

Group 1	22.95	11.77
Group 2	22.45	11.77
Group 3	19.16	11.77

Group 1-Jack Hammers,Tampers,Motorized Tampers and Compactors,Street Cleaning Machines,Scaffold Builder,Hydro Demolition Equipment, all types of Motorized fork lifts riding Motor Buggy operator,Conveyor operator, Bobcat operator,Mortar Man,Burners, Nozzle man on gunite work, Mortar Man shall include all laborers engaged in any mode of mixing aggregate by hand or mechanical means with the exception of silo work.

Group 2-Basic laborer's rate and includes all work not included in Group 1 or Group 3

2.Group 3-Laborers doing janitorial-type clean-up work associated with the turnover of the project or part of a project to the owner.

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LABO0239C 05/01/2002

Rates                      Fringes

PASSAIC COUNTY (Twps or Boroughs of Passaic, Garfield, Lodi, Wallington, Delawanna, Allwood, Athenia, Clifton to Piaget Ave, Paterson, Albion Place, Lettle Falls, Totowa, West Paterson, Wayne Hawthorne, Pompton, Haledon, West Milford, Ringwood, Bloomingdale, East Paterson to the Garfield boundary line)

LABORERS BUILDING CONSTRUCTION:

GROUP 1	22.95	11.77
GROUP 2	22.45	11.77
GROUP 3	19.16	11.77

GROUP 1-Specialist laborer classification including jack hammer, tamper, motorized tampers and compactors, street cleaning machines, scaffold builder, hydro demolition equipment, all types of motorized fork lifts, riding motor buggy operator, conveyor operator, Bobcat operator, mortar man, burners, nozzle man on gunite work, Mortar man shall include all laborers engaged in any mode of mixing aggregate by hand or mechabical means with the exception of silo work.

GROUP 2-Basic laborer's rate and includes all work not included in GROUP 1 or GROUP 3.

GROUP 3-Laborers doing janitorial- type light clean-up work associated with the turnover of the project or part of a project to the owner.

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LABO0346B 05/01/2002

Rates                      Fringes

BERGEN COUNTY (Cliffside; Borough of Cliffside Park; Borough of

Fort Lee South of Central Blvd; Borough of Palisades Park South of Central Blvd; Borough of Ridgefield; Borough of Edgewater; Borough of FAirview; Hackensack; City of Hackensack; Hasbrouck Heights; Little Ferry; South Hackensack; Ridgefield Park; Bogota; Teaneck Twp. West of Teaneck Rd. and South of Fort Lee Rd.; Maywood; Saddle Brook Twp; Borough of Paramus East of Sprout Brook; Borough of River Edge; New Milford; Teterboro; Bendix; Tohell Park; Englewood; City of Englewood; Borough of Dumont; Borough of Bergenfield; Borough of Palisades Park North of Central Blvd. to Edgewater; Fort Lee to the Hudson River; Borough of Fort Lee North of Central Blvd.; Twp. of Teaneck, East of Teaneck Rd. and North of Fort Lee Rd.; Borough of Leonia; Borough of Englewood Cliffs; Borough of Tenafly; Borough of Cresskill; Borough of Demarest; Borough of Closter; Borough of Oradell; Borough of Montvale; Borough of Woodcliff Lake; Borough of Park Ridge; Borough of Hillsdale; Twp. of Washington; Borough of

Westwood; Borough of Emerson; Borough of Haworth; Borough of Alpine; Borough of Rockleigh; Borough of Norwood; Borough of Harrington Park; Borough of Old Tappan; Borough of Northvale; Township of Rivervale; Lyndhurst; Rutherford; East Rutherford; Wood-Ridge; Carlton; Carlstadt; North Arlington; Moonachie; Ridgewood; Village of Ridgewood; Borough of Fair Lawn; Borough of Glen Rock; Borough of Hohokus; Borough of Saddle River; Borough of Upper Saddle River; Borough of Allendale; Borough of Ramsey; Borough of Waldwick; Borough of Midland Park; Borough of Oakland; Borough of Franklin Lakes; Twp. of Wyckoff; Twp. of Hohokus; Borough of Paramus except East of Sprout Brook; and Borough of MAhwah)

#### LABORERS:

Group 1	22.95	11.77
Group 2	22.45	11.77
Group 3	19.16	11.77

Group 1-Jack Hammers,Tampers,Motorized Tampers and Compactors,Street Cleaning Machines,Scaffold Builder,Hydro Demolition Equipment, all types of Motorized fork lifts riding Motor Buggy operator,Conveyor operator, Bobcat operator,Mortar Man,Burners, Nozzle man on gunite work, Mortar Man shall include all laborers engaged in any mode of mixing aggregate by hand or mechanical means with the exception of silo work.

Group 2-Basic laborer's rate and includes all work not included in Group 1 or Group 3

2.Group 3-Laborers doing janitorial-type clean-up work associated with the turnover of the project or part of a project to the owner.

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LABO0394C 05/01/2002

	Rates	Fringes
UNION COUNTY:		

#### BUILDING CONSTRUCTION:

##### LABORERS:

GROUP 1	22.95	11.77
GROUP 2	22.45	11.77
GROUP 3	19.16	11.77

GROUP 1-Specialist laborer classification including jack hammer, tamper, motorized tampers and compactors, street cleaning machines, scaffold builder, hydro demolition equipment, all types

of motorized fork lifts, riding motor buggy operator, conveyor operator, Bobcat operator, mortar man, burners, nozzle men on guniting work. Mortar men shall include all laborers engaged in any mode of mixing aggregate by hand or mechanical means with the exception of silo fed.

GROUP 2-Basic laborer's rate and includes all work not included in GROUP 1 or GROUP 3.

GROUP 3-Laborers are laborers doing, janitorial-type light clean-up work associated with the turnover of the project or part of a project to the owner, and all flagman, watchman, firewatch personnel, and those manning temporary heat of all types.

LABO0472B 03/01/2002

	Rates	Fringes
LABORERS [FREE AIR TUNNEL]:		
GROUP 1	27.25	12.95+A
GROUP 2	23.85	12.95+A
GROUP 3	23.70	12.95+A
GROUP 4	23.20	12.95+A

FOOTNOTE:

A. PAID HOLIDAYS: New Year's Day; Washington's Birthday, Memorial Day; Independence Day; Labor Day; Thanksgiving Day; Christmas Day; Presidential Election Day; and Veterans Day; provided the employee works on 3 days for the same Employer within a period of ten working days consisting of five working days before and five working days after the day upon which the holiday falls or is observed.

LABORERS CLASSIFICATIONS  
[FREE AIR TUNNEL]

GROUP 1: Blasters

GROUP 2: Skilled men (including miners; drill runners; iron men maintenance men; conveyor men; safety miners; riggers; block layers; cement finishers; rodmen; caulkers; powder carrier; all other skilled men)

GROUP 3: Semi-skilled men (including chuck tenders; trackmen; nippers; brakemen; derail men; cable men; hose men; grout men; gravel men; form men; bell or signal men (top or bottom); form workers and movers; concrete workers; shaft men; tunnel laborers; all other semi-skilled men)

GROUP 4: All other top laborers

LABO0472E 03/01/2003

	Rates	Fringes
LABORERS HEAVY AND HIGHWAY CONSTRUCTION:		
GROUP 1	25.30	11.80+A
GROUP 2	25.50	11.80+A
GROUP 3	25.80	11.80+A
GROUP 4	26.00	11.80+A
GROUP 5	26.25	11.80+A
GROUP 6	29.80	11.80+A
GROUP 7a	28.30	11.80+A
GROUP 7b	26.30	11.80+A

## FOOTNOTE:

A. PAID HOLIDAYS: New Year's Day; Washington's Birthday; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; Christmas Day; Presidential Election Day; and Veteran's Day; provided the employee works on 3 days for the same Employer within a period of ten working days consisting of five working days before and five working days after the day upon which the holiday falls or is observed.

## LABORERS CLASSIFICATIONS HEAVY &amp; HIGHWAY

GROUP 1: Common laborers; landscape laborers; railroad track laborers; pitmen and dumpmen; waterproofing; rakers and tampers on cold patch work and wrapping and coating all pipe  
Asphalt Laborers:

GROUP 2: Powder carriers and magazine tenders; signalmen  
Asphalt Raker, & Asphalt Screedman

GROUP 3: Sewer pipe; laser men; conduit and duct line layers; jackhammer; chipping hammers; pavement breakers; power buggies; concrete cutters, asphalt cutters; sheet hammer and tree cutter operators; sandblasting, cutting, burning, Power Tool Operator, and such other power tools used to perform work usually done manually by laborers

GROUP 4: Wagon drill operator; timberman; drill master

GROUP 5: Finisher; form setter; rammer; paver; gunite nozzle man and stone cutter; Catch Basin or Inlet Builder Manhole

GROUP 6: Blaster

GROUP 7a: Hazardous waste laborer required to wear level A, B, or C personal protection.

GROUP 7b: Certified laborer working a hazardous waste removal project or site at a task requiring hazardous waste related certification, but who is not working in a zone requiring level A, B, or C personal protection.

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LABO0502B 05/01/2002

Rates                      Fringes

ESSEX COUNTY (City of East Orange, Twps of South Orange and  
Maplewood, Cities of Orange and West Orange):

LABORERS:

Group 1	22.95	11.77
Group 2	22.45	11.77
Group 3	19.16	11.77

Group 1-Jack Hammers,Tampers,Motorized  
Tampers and Compactors,Street Cleaning  
Machines,Scaffold Builder,Hydro Demolition  
Equipment, all types of Motorized fork lifts  
riding Motor Buggy operator,Conveyor operator,  
Bobcat operator,Mortar Man,Burners, Nozzle man  
on gunite work, Mortar Man shall include all  
laborers engaged in any mode of mixing aggregate  
by hand or mechanical means with the exception of  
silo work.

Group 2-Basic laborer's rate and includes all work  
not included in Group 1 or Group 3

2.Group 3-Laborers doing janitorial-type clean-up work  
associated with the turnover of the project or part of a  
project to the owner.

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LABO0526C 05/01/2002

Rates                      Fringes

MORRIS COUNTY (Remainder):

LABORERS:

Group 1	22.95	11.77
Group 2	22.45	11.77
Group 3	19.16	11.77

Group 1-Jack Hammers,Tampers,Motorized  
Tampers and Compactors,Street Cleaning  
Machines,Scaffold Builder,Hydro Demolition  
Equipment, all types of Motorized fork lifts  
riding Motor Buggy operator,Conveyor operator,

Bobcat operator,Mortar Man,Burners, Nozzle man  
on gunite work, Mortar Man shall include all  
laborers engaged in any mode of mixing aggregate  
by hand or mechanical means with the exception of  
silo work.

Group 2-Basic laborer's rate and includes all work not included in Group 1 or Group 3

2.Group 3-Laborers doing janitorial-type clean-up work associated with the turnover of the project or part of a project to the owner.

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LABO0569B 05/01/2002

Rates                  Fringes

HUNTERDON AND WARREN COUNTIES:

LABORERS BUILDING CONSTRUCTION:

CLASS A	22.95	11.77
CLASS B	22.45	11.77
CLASS C	19.16	11.77

DEFINATION OF LABORERS:

CLASS A-Jack Hammer, Tamper, Motorized Tampers and Compactors, Street Cleaning Machines, Scaffold Builder, Hydro Demolition Equipment, All types of Motorized Fork Lifts, Riding Motor Buggy Operator, Bobcat Operator, Mortar Man, Burners, Nozzle Man on Gunite work.

CLASS B-All Laborers not listed in Class A or C.

CLASS C-Laborers doing Janitorial- type light clean up work associated with the turnover of the project to the owner All Flagman, and those manning tempory heat of all types.

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LABO0694B 05/01/2002

Rates                  Fringes

ESSEX COUNTY (Montclair):

LABORERS:

Group 1	22.95	11.77
Group 2	22.45	11.77
Group 3	19.16	11.77

Group 1-Jack Hammers,Tampers,Motorized Tampers and Compactors,Street Cleaning Machines,Scaffold Builder,Hydro Demolition Equipment, all types of Motorized fork lifts riding Motor Buggy operator,Conveyor operator, Bobcat operator,Mortar Man,Burners, Nozzle man on gunite work, Mortar Man shall include all laborers engaged in any mode of mixing aggregate by hand or mechanical means with the exception of silo work.



Group 2-Basic laborer's rate and includes all work  
not included in Group 1 or Group 3

2.Group 3-Laborers doing janitorial-type clean-up work  
associated with the turnover of the project or part of a  
project to the owner.

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LABO0711B 05/01/2002

Rates Fringes

MORRIS COUNTY (Morristown, Morris Twp., Morris Plains,Mendham,  
Ralston, Chester, Brookside, Flanders, Ironia, Mount Freedom,  
Mount Tabor, Parsippany, Troy Hills, Pine Brook,Ced Knools,  
Whippany, Hanover Twp. and Long Valley):

LABORERS:

Group 1	22.95	11.77
Group 2	22.45	11.77
Group 3	19.16	11.77

Group 1-Jack Hammers,Tampers,Motorized  
Tampers and Compactors,Street Cleaning  
Machines,Scaffold Builder,Hydro Demolition  
Equipment, all types of Motorized fork lifts  
riding Motor Buggy operator,Conveyor operator,  
Bobcat operator,Mortar Man,Burners, Nozzle man  
on gunite work, Mortar Man shall include all  
laborers engaged in any mode of mixing aggregate  
by hand or mechanical means with the exception of  
silo work.

Group 2-Basic laborer's rate and includes all work  
not included in Group 1 or Group 3

2.Group 3-Laborers doing janitorial-type clean-up work  
associated with the turnover of the project or part of a  
project to the owner.

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LABO0779B 05/01/2002

Rates Fringes

SOMERSET COUNTY (Bridgewater,Branchburg, Raritan, Bound Brook,  
Somerville, Manville, Hillsboro, Millstone, Montgomery and Rocky  
Hill Twp.):

LABORERS:

Group 1	22.95	11.77
Group 2	22.45	11.77
Group 3	19.16	11.77

Group 1-Jack Hammers,Tampers,Motorized  
Tampers and Compactors,Street Cleaning

Machines,Scaffold Builder,Hydro Demolition  
Equipment, all types of Motorized fork lifts  
riding Motor Buggy operator,Conveyor operator,  
Bobcat operator,Mortar Man,Burners, Nozzle man  
on gunite work, Mortar Man shall include all  
laborers engaged in any mode of mixing aggregate  
by hand or mechanical means with the exception of  
silo work.

Group 2-Basic laborer's rate and includes all work  
not included in Group 1 or Group 3

2.Group 3-Laborers doing janitorial-type clean-up work  
associated with the turnover of the project or part of a  
project to the owner.

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LABO0913B 05/01/2002

Rates Fringes

MORRIS (Jefferson, Rockaway, Mount Arlington, Rockaway Borough,  
Wharton, Mine Hill, Dover, Netcong, Roxbury, Mount Oliver,  
Randolph, Boonton, Boonton Twp.,Montville, Lincoln Park  
Borough, Butler, Kinnelon Borough, Pin Brook, Towaco,  
Danville, Mountain Lakes, Pequannock, Pompton Plains,  
Riverdale Borough Twps) AND SUSSEX COUNTIES

#### LABORERS BUILDING CONSTRUCTION:

Class A Laborer:	22.95	11.77
Class B Laborer:	22.45	11.77
Class C Laborer:	19.16	11.77

Class A Laborer:Jack Hammer,tamper, motorized tampers and  
compactors, street cleaning machines, scaffold builder,  
hydro demolition equipment, all types of motorized fork lifts,  
bobcat operator, riding motor buggy operator, conveyor operator  
mortar man (except silo feed operations), burners, & nozzle  
man on gunnite work.

Class B Laborer:All laborers not listed in Class A.

Class C Laborer:Laborers doing Janitorial type light clean up  
work, associated with the turnover of the project to the owner  
All Flagman, and those manning temporary heat of all types.

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LABO1030A 04/01/2001

Rates Fringes

LABORERS: (The removal, abatement, enclosure and decontamination  
of personal protective equipment, chemical protective clothing

and machinery relating to asbestos and/or toxic and hazardous waste of materials which shall include but not necessarily be limited to: the erection, moving, servicing and dismantling to all enclosures, scaffolding, barricades, and the operation of all tools and equipment normally used in the removal or abatement of asbestos and toxic and hazardous waste or materials, the

labeling, bagging, cartoning, crating, or other packaging of materials for disposal; and the clean up of the work site and all other work incidental to the removal, abatement, encapsulation, enclosure, and decontamination of asbestos or toxic and hazardous waste materials; and in addition, all work tasks involved in the maintenance and operation of energy resource recover plants (co-generation plants).)

LABORERS	21.85	10.12
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LABO1153B 05/01/2002

Rates	Fringes
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ESSEX COUNTY (Remainder), AND HUDSON (Kearny, East Newark and Harrison):

LABORERS:

Group 1	22.95	11.77
Group 2	22.45	11.77
Group 3	19.16	11.77

Group 1-Jack Hammers,Tampers,Motorized Tampers and Compactors,Street Cleaning Machines,Scaffold Builder,Hydro Demolition Equipment, all types of Motorized fork lifts riding Motor Buggy operator,Conveyor operator, Bobcat operator,Mortar Man,Burners, Nozzle man on gunite work, Mortar Man shall include all laborers engaged in any mode of mixing aggregate by hand or mechanical means with the exception of silo work.

Group 2-Basic laborer's rate and includes all work not included in Group 1 or Group 3

2.Group 3-Laborers doing janitorial-type clean-up work associated with the turnover of the project or part of a project to the owner.

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PAIN0711D 05/01/2000

Rates	Fringes
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PAINTERS:

NEW:

Painters	28.75	2.55+27%
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Paperhangers	28.75	2.55+27%
Spray,Sandblast,High Work	31.25	2.55+27%
Bridge	31.25	2.55+27%
REPAINT:		
Painters	22.00	2.55+27%
Spray,sandblast,High Work	24.00	2.55+27%

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PAIN0711F 05/01/2000

	Rates	Fringes
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GLAZIERS	28.75	10.30
GLAZIERS-HIGH WORK	29.75	10.30

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PAIN0711J 08/01/1999

	Rates	Fringes
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DRYWALL FINISHERS & TAPERS	28.25	11.23
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PLAS0008M 11/01/2001

	Rates	Fringes
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HUNTERDON,MIDDLESEX,&amp; SOMERSET COUNTIES:

PLASTERERS	28.50	13.40
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**NJ030003 - 1**

PLUM0009C 03/01/2003

	Rates	Fringes
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AIR CONDITIONING &amp; REFRIGERATION MECHANIC

Installation of refrigeration  
equipment for any type of building  
where the combined compressor  
tonnage does not exceed 5 tons,  
Installation of water-cooled air  
conditioning that does not exceed  
10 tons (includes the piping of  
compenent system and the erection  
ofthe water tower), Installation  
of air-cooled air conditioning  
that does not exceed 15 tons

	25.92	10.33+A
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## FOOTNOTE:

A. Paid Holidays: New Year's Day, Washington's Birthday,  
Memorial Day, Independence Labor Day, Thanksgiving Day,  
Christmas Day, plus Washington's Birthday and Veterans Day.

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PLUM0009H 07/01/2001

	Rates	Fringes
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HUNTERDON (Remainder), MERCER,MIDDLESEX (Excluding  
Dunellen,Borough, East Bound Brook,

Middlesex, New Market, Oak Tree, Piscataway Twp and South Plainfield), AND SOMERSET (Remainder) COUNTIES

PLUMBERS & PIPEFITTERS	33.13	15.25
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PLUM0014B 05/01/2002

Rates	Fringes
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BERGEN, HUDSON (Bayonne, Guttenberg, Hoboken, Jersey City, North Bergen, Secaucus, Union City, Weehawken, West New York), MORRIS (From Mount Olive straight across Randolph down to the Essex border), PASSAIC, SUSSEX, AND WARREN (Northern half) COUNTIES

PLUMBERS	34.83	15.40
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PLUM0024A 05/01/2002

Rates	Fringes
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Essex:

HUDSON (East Newark,Harrison,& Kearney only);

HUNTERDON (Alexandria, Alexandria Twp., Alexauken, Allens Corner, Allerton, Amsterdam, Annadale, Anthony, Baptistown, Bellewood, Bethlehem, Twp., Bissell, Bloomsbury, Bunnvale, Bottonwood Corners, Centerville, Charlestown, Cherryville, Clinton, Clinton Twp., Cokebury, Coles Mills, Croton, Delaware Twp., Dilts Corner East Amwell Twp., Everittstown, Fairmount, Farmersville, Franklin Twp., Frenchtown, Glen Gardner, Grandin, Hamden, Hampton, Higginsville, High Bridge, Hoffmans, Holland Twp., Highesville, Johnsons, Jutland, King, Kingwood Twp., Klinesville, Landsdowne, Lebanon, Lebanon Twp., Little Brook, Little Neck, Little York, Ludlow, McPherson, Milford, Moutainville, Mount Joy, Mount Pleasant, North Salem, Muirshead, New Germantown, New Hampton, Newport, Norton, Oak Grove, Oldwick, Palmyra, Palmyra Corners, Pattenburg, Perryville, Pittstown, Pleasant Run, Polktown, Potterstown, Quakertown, Raritan Twp., Readington, Readington Twp., Reaville, Rileyville, Riverside, Rockafellows, Rowland Mills Sidney, Snyderstown, Spring Mills, Stanton, Stanton Station Sunnyside, Sutton, Tewksbury, Tewksbury Twp.,The Point, Three Bridges, Treasure Island, Tumble, Union, Union Twp., Unionville Van Syckle, Warren Paper Mills, Wertsville, West End, West Portal White House, Whitehouse Station, Woodglen).

MIDDLESEX (Dunellen Borough, East Bound Brook, Middlesex, New Market, Oak Tree, Piscataway Twp., & South Plainfield only).

MORRIS (Bartley, Berkshire Valley, Bertland Island, Brookside, Chatham, Chatham Twp., Chester, Chester Twp., Cooks Bridge, Crestmoore, Gillette, Harding Twp., Ironia, Logansville, Long Valley, Malapardis, Mendham, Mendham Twp., Middle Valley, Millington, Milltown, Milton, Mount Freesom, Mount Olive Twp.,Mount Paul, Myerstown, Maughright, New Vernon, Parker,

Passaic Twp, Pleasant Grove, Ralston, Schooleys, Mount Stanley, Stephensonburg, Stirling, & Washint Twp.)

SOMERSET (Amwell, Basking Ridge, Bedminster, Bedminster Twp., Bernards Twp., Bernardsville, Blaziers Corner, Bound Brook, Bradley Gardens, Branchburg Twp., Bridgewater Twp., Burnt Mill, Centerville, Chimney Rock, Claver Hill, Dutchtown, Far Hills Borough, Finderne, Flagstown, Frank Fort, Franklin Park, Franklin Twp., Gallia, Gladstone, Greater Cross Roads, Hamilton, Harmony, Harmony Colony, Higgins Mills, Hillsborough Twp., Lamington, Lanes Crossing, Liberty Corners, Lyons, Madisonville, Manville, Manville Borough, Martinsville, Mettler, Millstone, Mine Brook, Montgomery, Montgomery Twp., Mount Bethel, Mount Horeb, Neshanic, Neshanic Station, North Branch, North Branch Depot, North Plainfield, Peapack, Peapack-Gladstone, Plainville Plukemin, Pottersville, Raritan, Ravine Lake, Rock Mill, Round

Top, Roycefield, Royce Valley, Seeley Mills, Smalleytown, Somerset, Somerville, Stone House, Sunset Lake, Union Village, Vliettown, Watchung, West Millington, Weston, White Bridge, Woodfern, Zarepat, & Zion).

UNION &

WARREN (Anderson, Asbury, Beattystown, Brainards, Brass Castle, Broadway, Buttzville, Carpetersville, Changewater, Cornish, Finesville, Foul Rift, Franklin Twp., Greenwich Twp., Harmony, Harmony Station, Harmony Twp., Haszen, Hope Twp., Hutchinson, Karrville, Kennedy, Lopatconq, Lopatconq Twp., Lower Harmony, Mansfield Twp., Montana, New Village, Oxford, Oxford Twp., Pequest, Pleasant Valley, Port Colden, Port Murray, Riegelsville, Rockport, Rocksbury, Roxburgh, Springtown, Stewartville, Still Valley, Vulcanite, Warren Glen, Washington, Washington Twp., White Top, & Phillipsburg Twp.) COUNTIES:

PLUMBERS (Excludes Somerset- Bldg)	34.78	15.20.
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PLUM0274B 05/01/2001

Rates	Fringes
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BERGEN, HUDSON, MORRIS (Remainder), PASSAIC, SUSSEX, AND WARREN (Remainder) COUNTIES

PIPEFITTERS	32.91	15.72
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PLUM0475B 05/01/2002

Rates	Fringes
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ESSEX; HUNTERDON (Alexandria, Alexandria Twp, Alexauken, Allens Corner, Allertown, Amsterdam, Annandale, Anthony, Baptistown, Bellewood, Bethlehem Twp, Bissell, Bloomsbury, Bunnvale, Buttonwood Corners, Centerville, Charlestown, Cherryville, Clinton, Cokebury, Coles Mills, Croton, Delaware Twp, Dilts

Corner, East Amwell Twp, Evittstown, Fairmount, Farmersville, Franklin Twp, Frenchtown, Glen Gardner, Grandin, Hamden, Hampton, Higginsville, High Bridge, Hoffmans, Holland Twp, Hughesville, Johnsons, Jutland, King, Kingwood Twp, Klinesville, Landsdowne, Lebanon, Lebanon Twp, Little Brooke, Little Neck, Little York, Ludlow, McPherson, Milford, Mountainville, Mount Joy, Mount Pleasant, Mount Salem, Muirshead, New Germantown, New Hampton, Newport, Norton, Oak Grove, Oldwick, Palmyra, Palmyra Corners, Pattenburg, Perryville, Pittstown, Pleasant Run, Polktown, Potterstown, Quakertown, Raritan Twp, Readington Twp); AND WARREN (Phillipsburg Twp) COUNTIES

PIPEFITTERS	34.22	17.28
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ROOF0004B 06/01/1996

Rates	Fringes
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ESSEX; HUDSON (West of the Hackensack River); MIDDLESEX (Remainder); MORRIS; SOMERSET (Remainder) SUSSEX; UNION; AND WARREN COUNTIES

ROOFERS:

Roofer, Composition, Damp & Waterproofing, Slate & Tile	24.22	11.75
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ROOF0004D 11/27/1994

Rates	Fringes
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HUNTERDON COUNTY:

ROOFERS:

Shingle, slate and tile	14.25	3.02
All other work	21.95	6.53 + A

FOOTNOTE:

A. Employer contribution of \$509.60 per month per employee to Health and Welfare Funds.

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ROOF0008F 07/01/2002

Rates	Fringes
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HUDSON COUNTY (Remainder)

ROOFERS:

Roofers, Composition, Damp and Waterproofing	30.08	18.78
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ROOF0010B 06/01/2002

Rates	Fringes
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BERGEN AND PASSAIC COUNTIES

ROOFERS, COMPOSITION	30.25	10.30
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SFNJ0669A 04/01/2003

	Rates	Fringes
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HUNTERDON; MIDDLESEX (Remainder); AND WARREN COUNTIES

SPRINKLER FITTERS	34.30	6.10
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SFNJ0696B 07/01/2002

	Rates	Fringes
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BERGEN, ESSEX, HUDSON, MIDDLESEX (New Brunswick, Milltown, Old Bridge, Browntown and North thereof), MORRIS, PASSAIC, SOMERSET (Bernardsville, Basking Ridge, Mine Brook, Far Hills, Lyons, Mount Bethel, Watchung, North Plainfield Martinville and Somerville), AND UNION COUNTIES

SPRINKLER FITTER	38.70	10.50
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SHEE0025C 06/01/2000

	Rates	Fringes
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BERGEN, ESSEX, HUDSON, MORRIS, PASSAIC, SOMERSET, SUSSEX, & UNION COUNTIES

SHEET METAL WORKERS	26.92	16.12
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SHEE0027A 06/01/2000

	Rates	Fringes
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HUNTERDON & MIDDLESEX COUNTIES:

SHEET METAL WORKERS	31.00	15.38
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SHEE0028D 06/01/1994

	Rates	Fringes
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WARREN COUNTY

SHEET METAL WORKERS	19.42	7.41
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TEAM0408B 05/01/1997

	Rates	Fringes
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ESSEX, MORRIS, AND UNION (Remainder) COUNTIES

TRUCK DRIVERS:

GROUP 1	24.45	7.01+A
GROUP 2	24.50	7.01+A
GROUP 3	24.60	7.01+A



GROUP 4                      24.70              7.01+A

FOOTNOTE:

A. Premium pay for hazardous waste removal: additional \$3.00 per hour if suite-up, otherwise \$1.00 per hour additional.  
Paid Holidays: New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Veteran's Day, Election Day, Thanksgiving Day, and Christmas Day, provided the employee has been assigned to work or "shifts" one day of the calendar week during which the holiday falls.  
Employer contribution of \$663.57 per month per employee to Health & Welfare Funds.

TRUCK DRIVERS CLASSIFICATIONS

GROUP 1: Drivers on the following type vehicles: Straight dumps, flats, floats, pickups, container haulers, fuel, water sprinkler, road oil, stringer, bead, hot pass, bus dumpcrete, transit mixers, agitator mixer, half truck, witch truck, side-o-matic, dynamite, powder, x-ray, welding, skid, jeep, station wagon, stringer, a-frame, all dual purpose trucks, trucks with mechanical tailgates, asphalt distributor, batch trucks, seeding, mulching, fertilizer, air compressor trucks (in transit), parts chaser, escort, scissor, hi-lift, telescope, concrete breaker, gin pole, stone, sand, asphalt distributor and spreader, nipper,

fuel trucks (drivers on fuel trucks including handling of hose and nozzle - entire unit), team drivers, vacuum or vac-all trucks (entire unit), skid truck (debris container - entire unit), concrete mobile trucks (entire unit), expediter (parts chaser), beltcrete trucks, pumpcrete trucks, line truck, reel truck, wreckers, utility trucks, tack trucks, warehousemen, warehouse parts-men, yardmen, lift truck in warehouse, warehouse clerk, parts man, material checker, receivers, shippers, binning men (materials), cardex man, drivers on the following type vehicles: broyhill coal tar epoxy trucks, little ford bituminous distributor, slurry seal truck or vehicle, thiokol track master pickup (swamp cat pickup); bucket loader dump truck and any rubber-tired tractor used in pulling and towing farm wagons and trailers of any description, similar type vehicles, off-site and on-site repair shop

GROUP 2: Drivers on straight 3-axle materials: trucks and floats

GROUP 3: Drivers on all euclid type vehicles: euclids, international harvestors, wabcos, caterpillar, koehring, tractors and wagons, dumpsters, straight, bottom, rear and side dumps, carry-alls and scrapers (not self-loading, loading over the top); water sprinkler trailers; water pulls and similar types of vehicles; drivers on tractors and trailer type vehicles: flat, floats, I-beams, low beds, water sprinkler, bituminous transit mix, road oil, fuel, bottom dump hopper, rear dump, office, shanty, epoxy, asphalt, agitator mixer, mulching, stringer,

seeding, fertilizing pole, spread, bituminous distributor, water pulls (entire unit) (tractor trailer), reel trailer, and similar types of vehicles

#### GROUP 4: Winch trailer drivers

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TEAM0469C 05/01/2000

Rates Fringes

HUNTERDON, MIDDLESEX, SOMERSET, UNION (up to Wood Avenue South of Cranford), AND WARREN COUNTIES

#### TRUCK DRIVERS:

GROUP 1	26.35	11.835+A
GROUP 2	26.40	11.835+A
GROUP 3	26.50	11.835+A
GROUP 4	26.60	11.835+A

#### FOOTNOTE:

A. PAID HOLIDAYS: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day, plus Washington's Birthday, Election Day and Veteran's Day, provided that the employee has been assigned to work or "SHIFTS" one day of the calendar week during which the holiday falls.

\$400.00 per year to Apprenticeship Training Fund.

\$3.00 per hour premium pay for hazardous waste work.

#### TRUCK DRIVERS CLASSIFICATIONS

GROUP 1: Drivers on the following type vehicles: straight dumps, flats, floats, pickups, container haulers, fuel, water sprinkler, road oil, stringer, bead, hot pass, bus dumpcrete, transit mixers, agitator mixer, half truck, winch truck, side-o-matic, dynamite, powder, x-ray, welding, skid, jeep, station wagon, stringer, A-frame, all dual purpose trucks, trucks with mechanical tailgates, asphalt distributor, batch trucks, seeding, mulching, fertilizer, air compressor trucks (in transit), parts chaser, escort, scissor, hi-lift, telescope, concrete breaker, gin pole, stone, sand, asphalt distributor and spreader, nipper, fuel trucks (drivers on fuel trucks including handling of hose and nozzle - entire unit), team drivers, vacuum or vac-all trucks (entire unit), skid truck (debris contained - entire unit), concrete mobile trucks (entire unit), expediter (parts chaser), beltcrete trucks, pumpcrete trucks, line truck, reel truck, wreckers, utility trucks, tack trucks, warehousemen, warehouse parts-men, yardmen, lift truck in warehouse, drivers on the following type vehicles: Broyhill coal tar epoxy trucks, little ford bituminous distributor, slurry seal truck or vehicle, thiokol track master pickup (swamp cat pickup); bucket loader dump truck and any rubber-tired tractor used in pulling and towing farm wagons and trailers of any description, similar type vehicles, off-site and on-site repair shop

GROUP 2: Drivers on straight 3-axle materials: trucks and floats

GROUP 3: Drivers on all euclid type vehicles: euclids, international harvesters, wabcos, caterpillar, koehring, tractors and wagons, dumpsters, straight, bottom, rear and side dumps, carry-alls and scrapers (not self-loading, loading over the top); water sprinkler trailers; water pulls and similar types of vehicles; drivers on tractors and trailer type vehicles: flat, floats, l-beams, low beds, water sprinkler, bituminous transit mix, road oil, fuel, bottom dump hopper, rear dump, office, shanty, epoxy, asphalt, agitator mixer, mulching, stringer, seeding, fertilizing pole, spread, bituminous distributor, water pulls (entire unit) (tractor trailer), reel trailer, and similar types of vehicles

GROUP 4: Winch trailer drivers

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TEAM0560C 05/01/1997

Rates Fringes

BERGEN, HUDSON AND PASSAIC COUNTIES

TRUCK DRIVERS:

GROUP 1	24.45	8.08+A
GROUP 2	24.50	8.08+A
GROUP 3	24.60	8.08+A
GROUP 4	24.70	8.08+A

FOOTNOTE:

A. PAID HOLIDAYS: New Year's Day, Washington's Birthday,

Memorial Day, Independence Day, Labor Day, Presidential Election Day, Veteran's Day, Thanksgiving Day, Christmas Day. \$3.00 per hour premium pay for hazardous work.

TRUCK DRIVERS CLASSIFICATIONS

GROUP 1: Drivers on the following type vehicles: straight dumps, flats, floats, pickups, container haulers, fuel, water sprinkler, road oil, stringer, bead, hot pass, bus dumpcrete, transit mixers, agitator mixer, half truck, winch truck, side-o-matic, dynamite, powder, x-ray, welding, skid, jeep, station wagon, stringer, A-frame, all dual purpose trucks, trucks with mechanical tailgates, asphalt distributor, batch trucks, seeding, mulching, fertilizer, air compressor trucks (in transit), parts chaser, escort, scissor, hi-lift, telescope, concrete breaker, gin pole, stone, sand, asphalt distributor and spreader, nipper, fuel trucks (drivers on fuel trucks including handling of hose and nozzle - entire unit), team drivers, vacuum or vac-all trucks (entire unit), skid truck (debris container - entire unit), concrete mobile trucks (entire unit), expediter (parts chaser), beltcrete trucks, pumpcrete trucks, line truck, reel truck,

wreckers, utility trucks, tack trucks, warehousemen, warehouse parts-men, yardmen, lift truck in warehouse, warehouse clerk, parts man, material checker, receivers, shippers, binning men (materials), cardex man, drivers on the following type vehicles: broyhill coal tar epoxy trucks, little ford bituminous distributor, slurry seal truck or vehicle, thiokol track master pickup (swamp cat pickup); bucket loader truck and any rubber-tired tractor used in pulling and towing farm wagons and trailers of any description, similar type vehicles, off-site and on-site repair shop

GROUP 2: Drivers on straight 3-axle materials: trucks and floats

GROUP 3: Drivers on all euclid type vehicles: euclids, international harvestors, wabcos, caterpillar, keohring, tractors and wagons, dumpsters, straight, bottom, rear and side dumps, carry-alls and scrapers (not self-loading, loading over the top); water sprinkler trailers; water pulls and similar types of vehicles; drivers on tractors and trailer type vehicles: flat, floats, I-beams, low beds, water sprinkler, bituminous transit mix, road oil, fuel, bottom dump hopper, rear dump, office, shanty, epoxy, asphalt, agitator mixer, mulching, stringer, seeding, fertilizing pole, spread, bituminous distributor, water pulls (entire unit) (tractor trailer), reel trailer, and similar types of vehicles

GROUP 4: Winch trailer drivers

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

#### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter

\* a conformance (additional classification and rate)  
ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U. S. Department of Labor  
200 Constitution Avenue, N. W.  
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N. W.  
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U. S. Department of Labor  
200 Constitution Avenue, N. W.  
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.  
END OF GENERAL DECISION

**SECTION 00901**

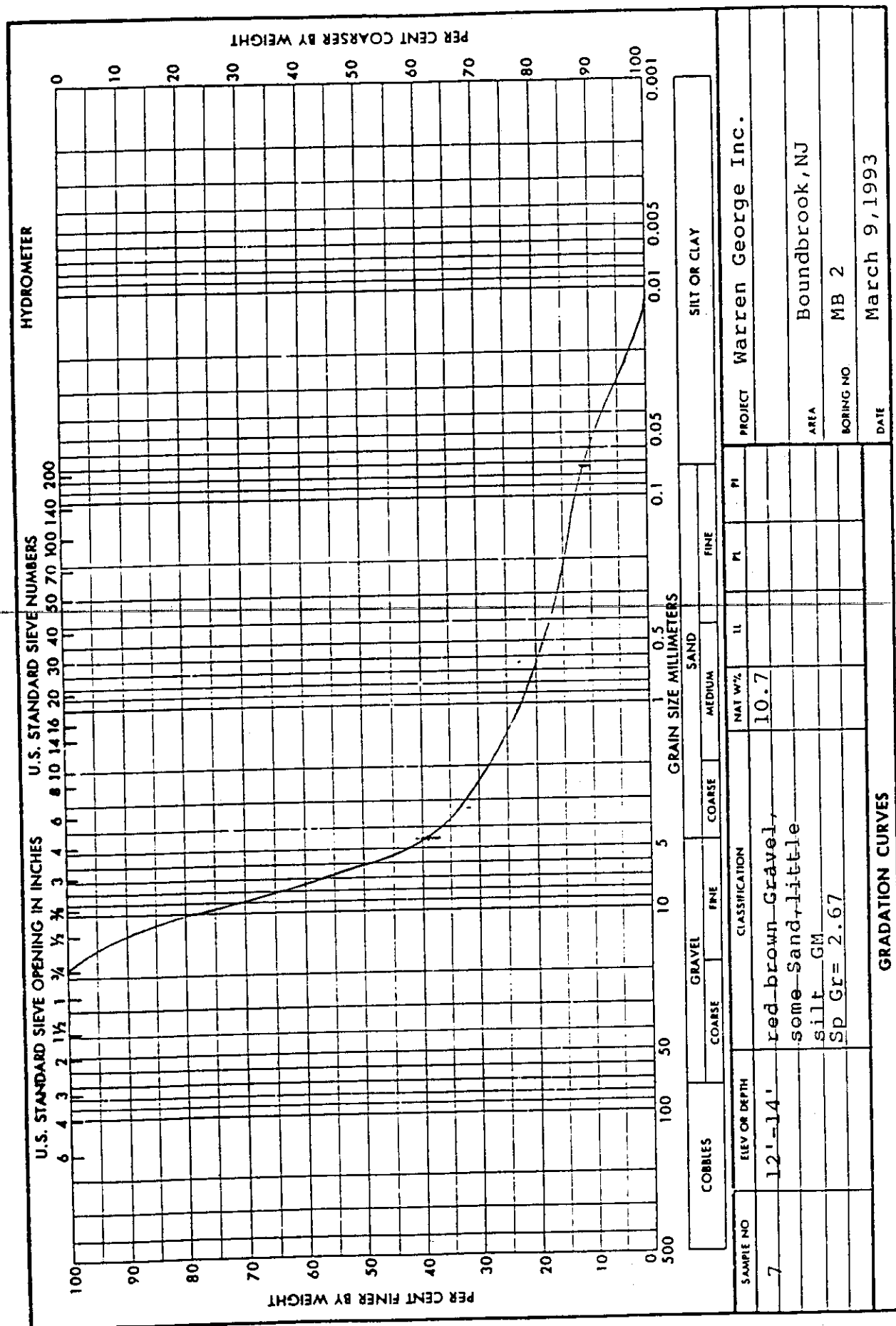
**SOIL TESTING AND GRAIN SIZE DISTRIBUTION REPORT**

Greenbrook Flood Control Project  
Soil Testing

Boring	Sample	Depth	% Gravel	% Sand	% Silt + Clay	Soil Type	Water	Unit Wt.	Specific Gravity	Permeability
BB 3										2.1x10
BB 4	2	5-7	61	16	23	GC-GM	25.9			
BB 5	3	4-6	58	31	12	GM	8.1		2.87	
BB 6	5	8-10	51	36	13	GC-GM	8.5			1.1x10
BB 7	3	10-12	0	26	74	CL	11.2		2.77	
MB 2	7	12-14	40	49	11	SP-SM	10.7		2.67	

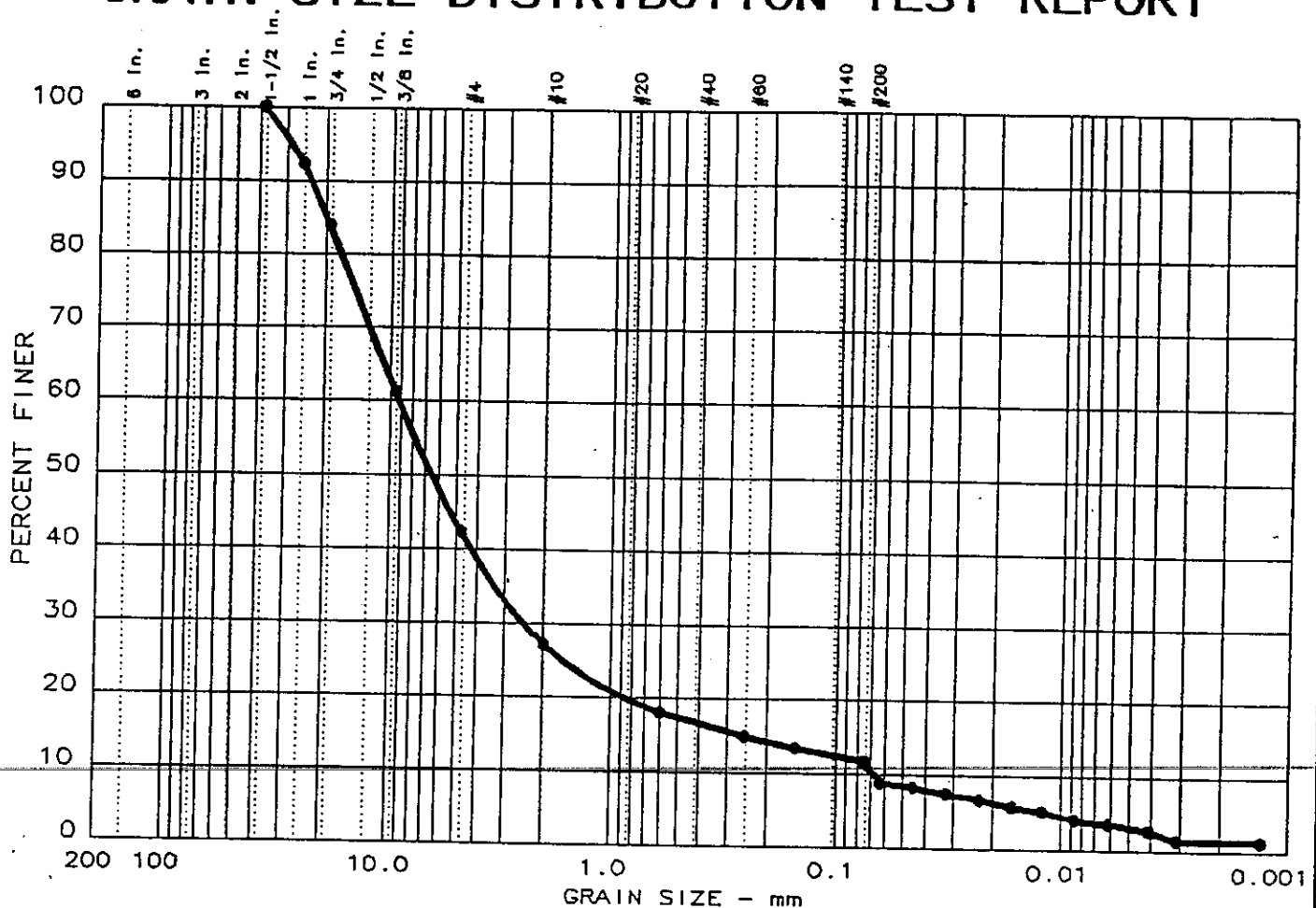
00901-1

1200 - 1000  
 1000 - 200  
 100 = 0.058

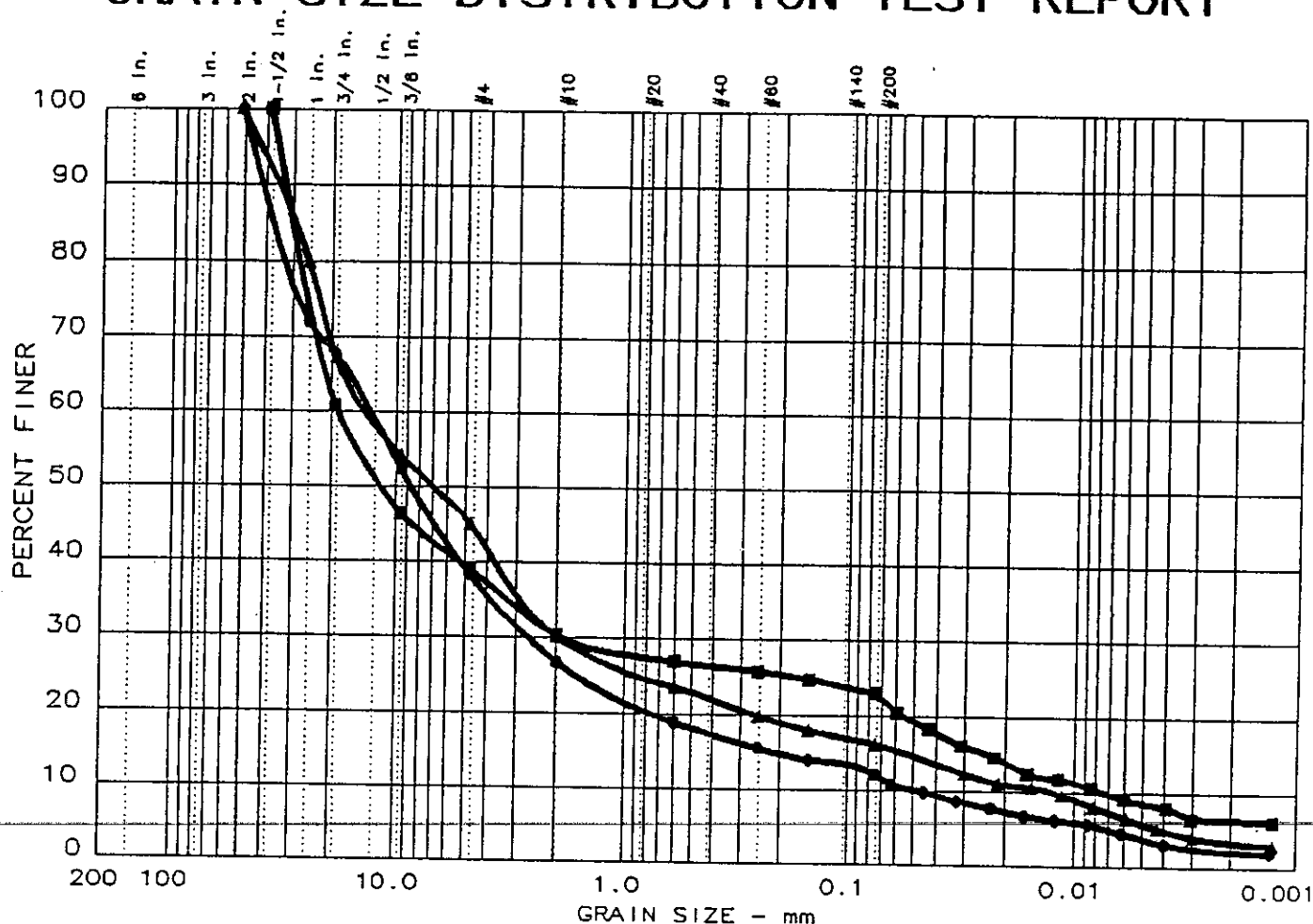




# GRAIN SIZE DISTRIBUTION TEST REPORT



# GRAIN SIZE DISTRIBUTION TEST REPORT



	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	61.7	26.1	8.4	3.8
▲	0.0	55.0	28.8	10.5	5.7
■	0.0	61.0	15.9	14.5	8.6

	LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
●			37.2	13.0	8.61	2.66	0.197	0.0479	11.35	272.3
▲			29.2	14.0	6.92	1.97	0.0531	0.0122	22.91	1148.2
■			30.4	18.5	11.7	1.92	0.0239	0.0074	26.92	2511.9

MATERIAL DESCRIPTION	USCS	AASHTO
● Brown silty, clayey gravel with sand	GC-GM	
▲ Brown silty, clayey gravel with sand	GC-GM	
■ Brown and gray clayey gravel with sand	GC	

Project No.: 94-37236-02

Project: Greenbrook Flood Control Project

● Location: BB-1A/S-5/9-11 ft.

▲ Location: BB-2/S-1/0-2 ft.

■ Location: BB-4/S-2/5-7 ft.

Date: 8-19-95



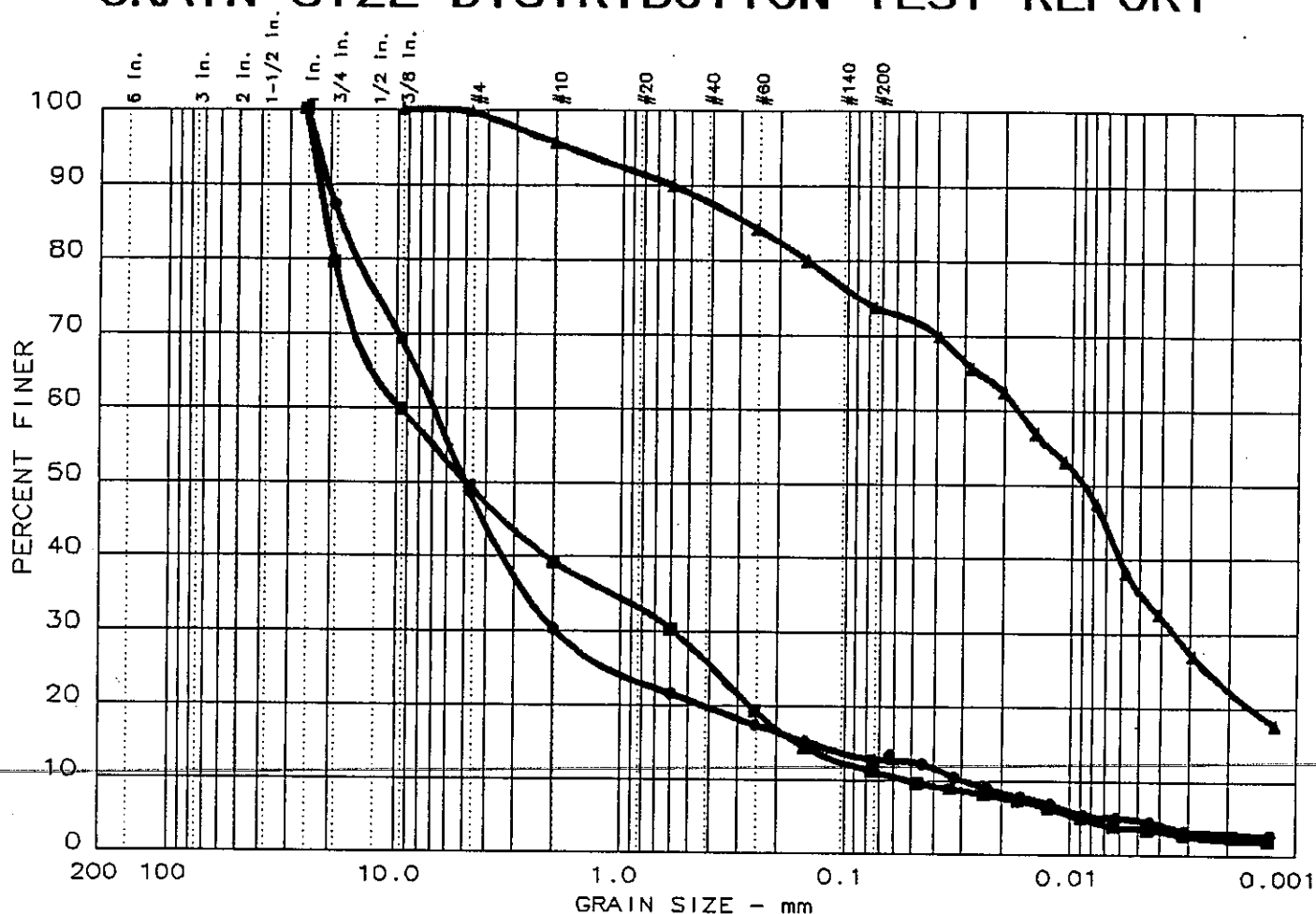
Converse Consultants East

Remarks:

Figure No. \_\_\_\_\_

00901-4

# GRAIN SIZE DISTRIBUTION TEST REPORT



	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	51.2	35.9	8.1	4.8
▲	0.0	0.2	26.0	38.3	35.5
■	0.0	50.5	38.2	7.7	3.6

	LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
●			17.8	6.84	4.95	1.95	0.140	0.0288	19.28	237.1
▲			0.282		0.0087	0.0035				
■			20.7	9.71	4.86	0.578	0.161	0.0521	0.66	186.2

MATERIAL DESCRIPTION	USCS	AASHTO
● Brown silty, clayey gravel with sand	GC-GM	
▲ Red brown clay with sand	CL	
■ Brown poorly graded gravel with silt and sand	GP-GM	

Project No.: 94-37236-02  
 Project: Greenbrook Flood Control Project  
 ● Location: BB-6/S-5/8-10 ft.  
 ▲ Location: BB-7/S-3/10-12 ft.  
 ■ Location: BB-8/S-2/5-7 ft.  
 Date: 7-17-95

Remarks:



Converse Consultants East

Figure No. \_\_\_\_\_

00901-5

**SECTION 00904**

**LIST OF ITEMS**

**LIST OF ITEMS**  
**GREENBROOK FLOOD CONTROL PROJECT**  
**SEGMENT U**

<b><u>Item No.</u></b>	<b><u>Description</u></b>
1	Protection and Maintenance of Traffic
2	Stream Diversion and Dewatering
3	Clearing and Grubbing
3a	Erosion and Sedimentation Control
4	Structures to be removed
5	Excavation, Common
6	Excavation, Stripping
7	Compacted Fill, Common
8	Compacted Embankment Material
9	Concrete
9a	Grout
10	Steel Reinforcement
11	Riprap
12	Crushed Stone
13	Bedding Material
14	Select Granular Material
15	Geotextile
16	5" Topsoil and Seeding
17a	Archeological Monitoring: Coordination Meeting
17b	Archeological Monitoring: Excavation
17c	Archeological Monitoring: Standby Time
17d	Archeological Monitoring: Secure and Open Trenches
18b	Steel Sheet Piling - PZ-27
19	Steel Channel - 6x10.5
20	Modified Steel Channel - 8x21.4
21	Not Used
22	Miscellaneous Steel
23	Waterstop Type "Y"
24	Bond Breaker
25	1/2" Pre-molded expansion joint material
26a	Aluminum Hatch Frame and Cover 30"x36"
26b	Aluminum Hatch Frame and Cover 30"x42"
26c	Aluminum Hatch Frame and Cover 30"x60"
26d	Aluminum Hatch Frame and Cover 30"x84"
27	Not Used
28a	Manhole Frame and Cover - Standard

28b	Manhole Frame and Cover - Conversion Type
28c	Not Used
28d	Type 'E' Inlet Frame and Cover
29	Manhole Steps
30	Handholds
31	Fixed Ladder
32	Retractable Safety Post
33a	36"x36" Motor Operated Sluice Gate
33b	60"x60" Motor Operated Sluice Gate
34a	18"x18" Hand Operated Sluice Gate
34b	24"x24" Hand Operated Sluice Gate
35	Not Used
36	Elastomer Check Valve
37a	Not Used
37b	Not Used
37c	18" Diameter Pipe
37d	24" Diameter Pipe
37e	Not Used
37f	Not Used
37g	60" Diameter Pipe
38	Not Used
39a	Subbase
39b	Dense Graded Aggregated Base Course 12" Thick
40	Bituminous Stabilized Base Course Mix 1-2
41a	Bituminous Concrete Surface Course Mix 1-5
41b	Bituminous Concrete Binder Course Mix 1-3
41c	Tack Coat
41d	Prime Coat
42	Anti-Graffiti Paint
43	Not Used
44	Vehicle Barrier Gate
45	Pipe Railing
46	Chain Link Fence
47	Electrical Work Drainage Structure No. 3
48	Electrical Work Drainage Structure No. 4
49	Gravel Surfacing
50	Relocate, Remove and/or Replace Existing Fences & Guard Rail
51	9"x18" Concrete Vertical Curb
52	Concrete Sidewalk, 4" Thick
53	Belgian Block Curb
54	Landscaping
55	Cellular Confinement System
56	Erosion Control Blanket

## SECTION 01312

RESIDENT MANAGEMENT SYSTEM (RMS)  
(NYD Version 09/00)

## PART 1 GENERAL

## 1.1 Sub Title

The Government will use the Resident Management System for Windows (RMS-W) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS-Windows, referred to as RMS-QC (QC for Quality Control), to record, maintain, and submit various information throughout the contract period. This joint Government-Contractor use of RMS-W and RMS-QC will facilitate electronic exchange of information and overall management of the contract. RMS-QC provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

The Government will use the Resident Management System for Windows (RMS-W) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS-Windows, referred to as RMS-QC (QC for Quality Control), to record, maintain, and submit various information throughout the contract period. This joint Government-Contractor use of RMS-W and RMS-QC will facilitate electronic exchange of information and overall management of the contract. RMS-QC provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

- Administration
- Finances
- Quality Control
- Submittal Monitoring
- Scheduling
- Import/Export of Data

## 1.1.1 Correspondence and Electronic Communications

For ease and speed of communications, both Government and Contractor will, to the maximum extent feasible, exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

## 1.1.2 Other Factors

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01320, "Project Schedule", Section 01330, SUBMITTAL PROCEDURES, and Section 01451, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the

reporting to be accomplished through RMS-QC. Also, there is no separate payment for establishing and maintaining the RMS-QC database; all costs associated therewith shall be included in the contract pricing for the work. Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01320, "Project Schedule", Section 01330, SUBMITTAL PROCEDURES, and Section 01451, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through RMS-QC. Also, there is no separate payment for establishing and maintaining the RMS-QC database; all costs associated therewith shall be included in the contract pricing for the work. Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01320, "Project Schedule", Section 01330, SUBMITTAL PROCEDURES, and Section 01451, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through RMS-QC. Also, there is no separate payment for establishing and maintaining the RMS-QC database; all costs associated therewith shall be included in the contract pricing for the work. Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01320, "Project Schedule", Section 01330, SUBMITTAL PROCEDURES, and Section 01451, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through RMS-QC. Also, there is no separate payment for establishing and maintaining the RMS-QC database; all costs associated therewith shall be included in the contract pricing for the work.

## PART 2 NOT USED

## PART 3 EXECUTION

### 3.1 RMS-QC SOFTWARE

RMS-QC is a Windows-based program that can be run on a stand-alone personal computer or on a network. Prior to the Pre-Construction Conference, the Contractor shall be responsible to download, install and use the latest version of the RMS-QC software from the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide RMS-QC on 3-1/2" high-density diskettes or CD-ROM. Any program updates of RMS-QC will be made available to the Contractor via the Government RMS Website as they become available. The Contractor shall log onto the RMS Site and download the RMS program after award of the construction contract.

### 3.2 SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run RMS-QC:

#### **Hardware**

IBM-compatible PC with 200 MHz Pentium or higher processor



64+ MB RAM

4 GB hard drive disk space for sole use by the RMS-QC system

3 1/2 inch high-density floppy drive

Compact disk (CD) Reader

Color monitor

Laser printer compatible with HP LaserJet III or better, with minimum 4 MB installed memory.

Connection to the Internet, minimum 28 BPS

#### **Software**

Microsoft (MS) Access 97 or newer version database software

MS Windows 95 or newer version operating system (MS Windows NT 4.0 or newer is recommended)

Word Processing software- MS Word 97 or newer

Internet browser

The Contractor's computer system shall be protected by virus protection software that is regularly upgraded with all issued manufacturer's updates throughout the life of the contract.

Electronic mail (E-mail) compatible with MS Outlook

### **3.3 RELATED INFORMATION**

#### **3.3.1 RMS-QC User Guide**

After contract award, the Contractor shall download instructions for the installation and use of RMS-QC from the Government RMS Internet Website ('<http://winrms.usace.army.mil>');

### **3.4 CONTRACT DATABASE**

Prior to the pre-construction conference, the Government shall provide the Contractor with basic contract award data to use for RMS-QC. The Government will provide data updates to the Contractor as needed, generally by files attached to E-mail. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

### **3.5 DATABASE MAINTENANCE**

The Contractor shall establish, maintain, and update data for the contract

in the RMS-QC database throughout the duration of the contract. The Contractor shall establish and maintain the RMS-QC database at the Contractor's site office. Data updates to the Government shall be submitted by E-mail with file attachments, e.g., daily reports, schedule updates, payment requests. If permitted by the Contracting Officer, a data diskette or CD-ROM may be used instead of E-mail (see Paragraph DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM). The RMS-QC database typically shall include current data on the following items:

### 3.5.1 Administration

#### 3.5.1.1 Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of RMS-QC software from the Government, the Contractor shall deliver Contractor administrative data in electronic format via E-mail.

#### 3.5.1.2 Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in RMS-QC. Within 14 calendar days of receipt of RMS-QC software from the Government, the Contractor shall deliver subcontractor administrative data in electronic format via E-mail.

#### 3.5.1.3 Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with "S". Letters initiated by the Contractor's home (main) office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

#### 3.5.1.4 Equipment

The Contractor's RMS-QC database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

#### 3.5.1.5 Management Reporting

RMS-QC includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of RMS-QC. Among these reports are: Progress Payment Request worksheet, QA/QC comments, Submittal Register Status, Three-Phase Inspection checklists.

### 3.5.2 Finances

#### 3.5.2.1 Pay Activity Data

The RMS-QC database shall include a list of pay activities that the Contractor shall develop in conjunction with the construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. CLINs may include multiple activities, but activities may be assigned to only one such CLIN Item. The total of all CLINs equals the Contract Amount.

#### 3.5.2.2 Payment Requests

All progress payment requests shall be prepared using RMS-QC. The Contractor shall complete the payment request worksheet and include it with the payment request. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using RMS-QC. The Contractor shall submit the payment requests with supporting data by E-mail with file attachment(s). If permitted by the Contracting Officer, a data diskette may be used instead of E-mail. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

#### 3.5.3 Quality Control (QC)

RMS-QC provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the RMS-QC generated daily report. The Contractor shall provide the Government a Contractor Quality Control (CQC) Plan within the time required in Section 01451, CONTRACTOR QUALITY CONTROL. Within seven calendar days of Government acceptance, the Contractor shall submit a data diskette or CD-ROM reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

##### 3.5.3.1 Daily Contractor Quality Control (CQC) Reports.

RMS-QC includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by RMS-QC shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the RMS-QC-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01451, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government using E-mail or diskette within 24 hours after the date covered by the report. Use of either mode of submittal shall be coordinated with the government representative. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

##### 3.5.3.2 Deficiency Tracking.

The Contractor shall use RMS-QC to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC Comments.

The contractor shall maintain a current log of its QC comments in the RMS-QC database. The Government will log the deficiencies it has identified using its QA comments. The Government's QA comments will be included in its export file to the Contractor. The contractor will acknowledge receipt of these QA comments by specific number reference on the Daily CQC Report. The Contractor shall regularly update the correction status of both QC and QA comments.

#### 3.5.3.3 Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in RMS-QC.

#### 3.5.3.4 Accident/Safety Tracking.

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize RMS-QC to advise the Government of any accidents occurring on the jobsite. This brief supplemental entry is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 200.

#### 3.5.3.5 Features of Work

The Contractor shall include a complete list of the features of work in the RMS-QC database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

#### 3.5.3.6 QC Requirements

The Contractor shall develop and maintain a complete list of QC Testing, Transfer Property listings, Installed Property listings, and User Training requirements in RMS-QC, all tied to individual pay activities. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via RMS-QC.

#### 3.5.4 Submittal Management

The contractor will initially be required to enter all required submittal information into RMS-QC. Thereafter, the Contractor shall maintain a complete list of all submittals, including completion of all data columns as described in Section 01330, SUBMITTAL PROCEDURES. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use RMS-QC to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced

using RMS-QC. RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

#### 3.5.5 Schedule

The Contractor shall develop a construction schedule consisting of pay activities, in accordance with Contract Clause "Schedules for Construction Contracts", or Section 01320, PROJECT SCHEDULE, as applicable. This schedule shall be input and maintained in the RMS-QC database either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01320 PROJECT SCHEDULE). The contractor shall be responsible for ensuring the SDEF is in the format required to upload the data to the RMS-QC Module; otherwise, the contractor will be required to enter the data manually. The updated schedule data shall be included with each pay request submitted by the Contractor.

#### 3.5.6 Import/Export of Data

RMS-QC includes the ability to export Contractor data to the Government and to import Government-provided data.

### 3.6 IMPLEMENTATION

Contractor use of RMS-QC as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its RMS-QC database, and to provide the Government with regular database updates. RMS-QC shall be an integral part of the Contractor's management of quality control.

#### 3.7 DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of updates, payment requests, correspondence and other data is by E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of computer diskettes or CD-ROM for data transfer. Data on the disks or CDs shall be exported using the RMS-QC built-in export function. If used, diskettes and CD-ROMs will be submitted in accordance with the following:

##### 3.7.1 File Medium

The Contractor shall submit required data on 3-1/2" double-sided high-density diskettes formatted to hold 1.44 MB of data, capable of running under Microsoft Windows 95 or newer. Alternatively, CD-ROMs may be used. They shall conform to industry standards used in the United States. All data shall be provided in English.

##### 3.7.2 Disk or CD-ROM Labels

The Contractor shall affix a permanent exterior label to each diskette and CD-ROM submitted. The label shall indicate in English, the RMS-QC file name, full contract number, project name, project location, data date, name and telephone number of person responsible for the data.

### 3.7.3 File Names

The Government will provide the file names to be used by the Contractor with the RMS-QC software.

### 3.7.4 Weekly Submission of export Files

The contractor shall, at a minimum, generate and submit weekly export file to the Gov't.

## 3.8 MONTHLY COORDINATION MEETING

The Contractor shall update the RMS-QC database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. As required in Contract Clause "Payments", at least one week prior to submittal, the contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions. The contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable RMS-QC export file is received.

## 3.9 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. The RMS-QC Module shall be completed to the satisfaction of the Contracting Officer prior to any contract payment (except for Bonds, and Insurance, as approved by the Contracting Officer).

-- End of Section --

## SECTION 01320

PROJECT SCHEDULE: NETWORK ANALYSIS SYSTEM  
07/97

## PART 1 GENERAL

## 1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

## SD-07 Schedules

Initial Project Schedule; G AE. Preliminary Project Schedule; G. Periodic Schedule Updates; G.

Four copies of the schedules showing codes, values, categories, numbers, items, etc., as required.

## SD-08 Statements

Qualifications.

Documentation showing qualifications of personnel preparing schedule reports.

## SD-09 Reports

Narrative Report. Schedule Reports.

Four copies of the reports showing numbers, descriptions, dates, float, starts, finishes, durations, sequences, etc., as required.

## 1.2 QUALIFICATIONS

The Contractor shall designate an authorized representative who shall be responsible for the preparation of all required project schedule reports. This person shall have previously created and reviewed computerized schedules. Qualifications of this individual shall be submitted to the Contracting Officer for review with the Preliminary Project Schedule submission.

## PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

## 3.1 GENERAL

Pursuant to the Contract Clause, SCHEDULE FOR CONSTRUCTION CONTRACTS a Project Schedule as described below shall be prepared. The scheduling of

construction shall be the responsibility of the Contractor. Contractor management personnel shall actively participate in its development. Subcontractors and suppliers working on the project should also contribute in developing and maintaining an accurate Project Schedule. The approved Project Schedule shall be used to measure the progress of the work, to aid in evaluating time extensions, and to provide the basis of all progress payments.

### 3.2 BASIS FOR PAYMENT

The schedule shall be the basis for measuring Contractor progress. Lack of an approved schedule or scheduling personnel shall result in an inability of the Contracting Officer to evaluate Contractor progress for the purposes of payment. Failure of the Contractor to provide all information, as specified below, shall result in the disapproval of the entire Project Schedule submission and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. In the case where Project Schedule revisions have been directed by the Contracting Officer and those revisions have not been included in the Project Schedule, then the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until revisions to the Project Schedule have been made.

### 3.3 PROJECT SCHEDULE

The computer software system utilized by the Contractor to produce the Project Schedule shall be capable of providing all requirements of this specification. Failure of the Contractor to meet the requirements of this specification shall result in the disapproval of the schedule. Manual methods used to produce any required information shall require approval by the Contracting Officer.

#### 3.3.1 Use of the Critical Path Method

The Critical Path Method (CPM) of network calculation shall be used to generate the Project Schedule. The Contractor shall provide the Project Schedule in either the Precedence Diagram Method (PDM) or the Arrow Diagram Method (ADM).

#### 3.3.2 Level of Detail Required

With the exception of the initial and preliminary schedule submission, the Project Schedule shall include an appropriate level of detail. Failure to develop or update the Project Schedule or provide data to the Contracting Officer at the appropriate level of detail, as specified by the Contracting Officer, shall result in the disapproval of the schedule. The Contracting Officer will use, but is not limited to, the following conditions to determine the appropriate level of detail to be used in the Project Schedule.

##### 3.3.2.1 Activity Durations

Contractor submissions shall be required to follow the direction of the Contracting Officer regarding reasonable activity durations. Reasonable



durations are those that allow the progress of activities to be accurately determined between payment periods. A rule of thumb, that the Contractor should use, is that less than 2 percent of all non-procurement activities' Original Durations shall be greater than 20 days.

#### 3.3.2.2 Procurement Activities

Tasks related to the procurement of long lead materials or equipment shall be included as separate activities in the project schedule. Long lead materials and equipment are those materials that have a procurement cycle of over 90 days. Examples of procurement process activities include, but are not limited to: submittals, approvals, procurement, fabrication, delivery, installation, start-up, and testing.

#### 3.3.2.3 Government Activities

Government and other agencies activities that could impact progress shall be shown. These activities include, but are not limited to: approvals, inspections, utility tie-in, Government Furnished Equipment (GFE) and notice to proceed for phasing requirements.

#### 3.3.2.4 Responsibility

All activities shall be identified in the project schedule by the party responsible to perform the work. Responsibility includes, but is not limited to, the subcontracting firm, contractor work force, or government agency performing a given task. Activities shall not belong to more than one responsible party. The responsible party for each activity shall be identified by the Responsibility Code.

#### 3.3.2.5 Work Areas

All activities shall be identified in the project schedule by the work area in which the activity occurs. Activities shall not be allowed to cover more than one work area. The work area of each activity shall be identified by the Work Area Code.

#### 3.3.2.6 Modification or Claim Number

Any activity that is added or changed by contract modification or used to justify claimed time shall be identified by a mod or claim code that changed the activity. Activities shall not belong to more than one modification or claim item. The modification or claim number of each activity shall be identified by the Mod or Claim Number.

#### 3.3.2.7 Bid Item

All activities shall be identified in the project schedule by the Bid Item to which the activity belongs. An activity shall not contain work in more than one bid item. the bid item for each appropriate activity shall be identified by the Bid Item Code.

#### 3.3.2.8 Phase of Work

All activities shall be identified in the project schedule by the phases of work in which the activity occurs. Activities shall not be allowed to contain work in more than one phase of work. The project phase of each activity shall be by the unique Phase of Work Code.

#### 3.3.2.9 Feature of Work

All activities shall be identified in the project schedule according to the feature of work to which the activity belongs. Feature of work refers, but is not limited to a work breakdown structure for the project. The feature of work for each activity shall be identified by the Feature of Work Code.

#### 3.3.3 Scheduled Project Completion

The schedule interval shall extend from notice-to-proceed to the contract completion date.

##### 3.3.3.1 Project Start Date

The schedule shall start no earlier than the date that the Notice to Proceed (NTP) was acknowledged. The Contractor shall include as the first activity in the project schedule an activity called "Start Project". The "Start Project" activity shall have: a "ES" constraint, a constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

##### 3.3.3.2 Constraint of Last Activity

Completion of the last activity in the schedule shall be constrained by the contract completion date. Calculation on project updates shall be such that if the early finish of the last activity falls after the contract completion date, then the float calculation shall reflect a negative float on the critical path. The Contractor shall include as the last activity in the project schedule an activity call "End Project". The "End Project" activity shall have: a "LF" constraint, a constraint date equal to the completion date for the project, and a zero day duration.

##### 3.3.3.3 Early Project Completion

In the event the project schedule shows completion of the project prior to the contract completion date, the Contractor shall identify those activities that have been accelerated and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. Contractor shall specifically address each of the activities noted at every project schedule update period to assist the Contracting Officer to evaluate the Contractor's ability to actually complete prior to the contract period.

##### 3.3.4 Interim Completion Dates

Contractually specified interim completion dates shall also be constrained to show negative float if the early finish date of the last activity in that phase falls after the interim completion date.

##### 3.3.4.1 Start Phase

The Contractor shall include as the first activity for a project phase an activity called "Start Phase X" where "X" refers to the phase of work. The "Start Phase X" activity shall have: a "ES" constraint, a constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

#### 3.3.4.2 End Phase

The Contractor shall include as the last activity in a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity shall have: a "LF" constraint, a constraint date equal to the completion date for the project, and a zero day duration.

#### 3.3.4.3 Phase X

The Contractor shall include a hammock type activity for each project phase called "Phase X" where "X:" refers to the phase of work. The "Phase X" activity shall be logically tied to the earliest and latest activities in the phase.

#### 3.3.5 Default Progress Data Disallowed

Actual Start and Finish dates shall not be automatically updated by default mechanisms that may be included in CPM scheduling software systems. Actual Start and Finish dates on the CPM schedule shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the Actual Start and Finish dates on the Daily Quality Control report for every in progress or completed activity and insure that the data contained on the Daily Quality Control reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes.

#### 3.3.6 Out-of-Sequence Progress

Activities that have posted progress without predecessors being completed (Out-of-Sequence Progress) shall be allowed only by the case-by-case approval of the Contracting Officer. The Contracting Officer may direct that changes in schedule logic be made to correct any or all out-of-sequence work.

#### 3.3.7 Extended Non-Work Periods

Designation of Holidays to account for non-work periods of over 5 days shall not be allowed. Non-work periods of over 5 days shall be identified by addition of activities that represent the delays. Modifications to the logic of the project schedule shall be made to link those activities that may have been impacted by the delays to the newly added delay activities.

#### 3.3.8 Negative Lags

Lag durations contained in the project schedule shall not have a negative value.

### 3.4 PROJECT SCHEDULE SUBMISSIONS

The Contractor shall provide the submissions as described below. The data disk, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

#### 3.4.1 Preliminary Project Schedule Submission

The Preliminary Project Schedule, defining the Contractor's planned operations for the first 60 calendar days shall be submitted for approval within 10 calendar days after Notice to Proceed is acknowledged. The approved preliminary schedule shall be used for payment purposes not to exceed 60 calendar days after Notice to Proceed.

#### 3.4.2 Initial Project Schedule Submission

The Initial Project Schedule shall be submitted for approval within 40 calendar days after Notice to Proceed. The schedule shall provide a reasonable sequence of activities which represent work through the entire project and shall be at a reasonable level of detail.

#### 3.4.3 Periodic Schedule Updates

Based on the result of progress meetings, specified in "Periodic Progress Meetings," the Contractor shall submit periodic schedule updates. These submissions shall enable the Contracting Officer or to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgement of the Contracting Officer or authorized representative, is necessary for verifying the contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made.

### 3.5 SUBMISSION REQUIREMENTS

The following items shall be submitted by the Contractor for the initial submission, and every periodic project schedule update throughout the life of the project:

#### 3.5.1 Data Disks

Two data disks containing the project schedule shall be provided. Data on the disks shall be in the format specified in Appendix A, "Standard Data Exchange Format".

##### 3.5.1.1 File Medium

Required data shall be submitted on 3.5 disks, formatted to hold 1.44 MB of data, under the MS-DOS Version 5.0 operating system.

##### 3.5.1.2 Disk Label

A permanent exterior label shall be affixed to each disk submitted. The label shall indicate the type of schedule (Initial, Update, or Change), full contract number, project name, project location, data date, name and

telephone number or person responsible for the schedule, and the MS-DOS version used to format the disk.

#### 3.5.1.3 File Name

Each file submitted shall have a name related to either the schedule data date, project name, or contract number. The Contractor shall develop a naming convention that will insure that the names of the files submitted are unique. the Contractor shall submit the file naming convention to the Contracting Officer for approval.

#### 3.5.2 Narrative Report

A Narrative Report shall be provided with each update of the project schedule. This report shall be provided as the basis of the Contractor's progress payment request. The Narrative Report shall include: a description of activities along the 4 most critical paths, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken.

#### 3.5.3 Approved Changes Verification

Only project schedule changes that have been previously approved by the Contracting Officer shall be included in the schedule submission. The Narrative Report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

#### 3.5.4 Schedule Reports

The format for each activity for the schedule reports listed below shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float. Actual Start and Actual Finish Dates shall be printed for those activities in-progress or completed.

##### 3.5.4.1 Activity Report

A list of all activities sorted according to activity number or "I-NODE" AND "J-NODE" and then sorted according to Early Start Date. For completed activities the Actual Start Date shall be used as the secondary sort.

##### 3.5.4.2 Logic Report

A list of Preceding and Succeeding activities for every activity in ascending order by activity number and then sorted according to Early Start Date. For completed activities the Actual Start Date shall be used as the secondary sort.

##### 3.5.4.3 Total Float Report

A list of all activities sorted in ascending order of total float. Activities which have the same amount of total float shall be listed in ascending order of Early Start Dates.

#### 3.5.4.4 Earnings Report

A compilation of the Contractor's Total Earnings on the project from the Notice to Proceed until the most recent Monthly Progress Meeting. This report shall reflect the Earnings of specific activities based on the agreements made in the field and approved between the Contractor and Contracting Officer at the most recent Monthly Progress Meeting. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining Contractor Payment. Activities shall be grouped by bid item and sorted by activity numbers. This report shall: sum all activities in a bid item and provide a bid item percent; complete and sum all bid items to provide a total project percent complete.

The printed report shall contain, for each activity: Activity Number or "i-node" and "j-node", Activity Description, Original Budgeted Amount, Total Quantity, Quantity to Date, Percent Complete (based on cost), Earnings to Date.

#### 3.5.5 Network Diagram

The network diagram shall be required on the initial schedule submission and on bi-monthly (60 days) schedule update submissions. In addition to other submission requirements, a single mylar reproduceable 20 inch by 30 inch size shall be submitted. The network diagram shall depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

##### 3.5.5.1 Continuous Flow

Diagrams shall show a continuous flow from left to right with no arrows from right to left. The activity or event number, description, duration, and estimated earned value shall be shown on the diagram.

##### 3.5.5.2 Project Milestone Dates

Dates shall be shown on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

##### 3.5.5.3 Critical Path

The critical path shall be clearly shown.

##### 3.5.5.4 Banding

Activities shall be grouped to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area and/or responsibility.

##### 3.5.5.5 S-Curves

Earnings curves showing projected early and late earnings and earnings to date.

### 3.6 PERIODIC PROGRESS MEETINGS

Progress meetings to discuss payment shall include a monthly on-site meeting or other regular intervals mutually agreed to at the preconstruction conference. During this meeting the Contractor will describe, on an activity by activity basis, all proposed revisions and adjustments to the project schedule required to reflect the current status of the project. The Contracting Officer will approve activity progress, proposed revisions, and adjustments as appropriate.

#### 3.6.1 Meeting Attendance

The Contractor's Project Manager and Scheduler shall attend the regular progress meeting.

#### 3.6.2 Update Submission Following Progress Meeting

A complete update of the project schedule containing all approved progress, revisions, and adjustments, based on the regular progress meeting, shall be submitted not later than 4 working days after the monthly progress meeting.

#### 3.6.3 Progress Meeting Contents

Update information, including Actual Start Dates, Actual Finish Dates, Remaining Durations, and Cost to Date shall be subject to the approval of the Contracting Officer. The following minimum set of items which the Contractor shall address, on an activity by activity basis, during each progress meeting.

##### 3.6.3.1 Start and Finish Dates

The Actual Start and Actual Finish dates for each activity currently in-progress or completed activities.

##### 3.6.3.2 Time Completion

The estimated Remaining Duration for each activity in-progress. Time-based progress calculations must be based on Remaining Duration for each activity.

##### 3.6.3.3 Cost Completion

The earnings for each activity started. Payment shall be based on earnings for each in-progress or completed activity. Payment for individual activities shall not be made for work that contains quality defects. A portion of the overall project amount may be retained based on delays of activities.

##### 3.6.3.4 Logic Changes

All logic changes pertaining to Notice to Proceed on change orders, change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress, lag durations, and other changes that have been made pursuant to contract

provisions shall be specifically identified and discussed.

#### 3.6.3.5 Other Changes

Other changes required due to delays in completion of any activity or group of activities are those delays beyond the Contractors control such as strikes and unusual weather. Also included are delays encountered due to submittals, Government Activities, deliveries or work stoppage which makes re-planning the work necessary, and when the schedule does not represent the actual prosecution and progress of the work.

### 3.7 REQUESTS FOR TIME EXTENSIONS

In the event the Contractor requests an extension of the contract completion date, he shall furnish such justification, project schedule data and supporting evidence as the Contracting Officer may deem necessary for a determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof of delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is obligatory to any approvals.

#### 3.7.1 Justification of Delay

The project schedule must clearly display that the Contractor has used, in full, all the float time available for the work involved with this request.

The Contracting Officer's determination as to the number of allowable days of contract extension, shall be based upon the project schedule updates in effect for the time period in question and other factual information. Actual delays that are found to be caused by the Contractor's own actions, which result in the extension of the schedule, shall not be a cause for a time extension to the contract completion date.

#### 3.7.2 Submission Requirements

The Contractor shall submit a justification for each request for a change in the contract completion date of under two weeks based upon the most recent schedule update at the time of the Notice to Proceed or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

- a. A list of affected activities, with their associated project schedule activity number.
- b. A brief explanation of the causes of the change.
- c. An analysis of the overall impact of the changes proposed.
- d. A sub-network of the affected area.

Activities impacted in each justification for change shall be identified by a unique activity code contained in the required data file.



### 3.7.3 Additional Submission Requirements

For any request for time extension for over 2 weeks, the Contracting Officer may request an interim update with revised activities for a specific change request. The Contractor shall provide this disk within 4 days of the Contracting Officer's request.

### 3.8 DIRECTED CHANGES

If Notice to Proceed (NTP) is issued for changes prior to settlement of price and/or time, the Contractor shall submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The proposed revisions to the schedule will be approved by the Contracting Officer prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until the Contractor submits revisions, and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer, then the Contractor shall advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless of the objections, the Contractor will continue to update their schedule with the Contracting Officer's revisions until a mutual agreement in the revisions may be made. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

### 3.9 OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

-- End of Section --

## SECTION 01330

SUBMITTAL PROCEDURES  
05/02

## PART 1 GENERAL

## 1.1 SUMMARY

## 1.1.1 Government-Furnished Information

Submittal register and/or database and submittal management program will be delivered to the contractor, by contracting officer. Register and/or database will have the following fields completed, to the extent that will be required by the Government during subsequent usage.

Column (c): Lists specification section in which submittal is required.

Column (d): Lists each submittal description (SD No. and type, e.g. SD-04 Drawings) required in each specification section.

Column (e): Lists one principal paragraph in specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (e) as limiting project requirements.

Column (f): Indicate approving authority for each submittal. A "G" indicates approval by contracting officer; a blank indicates approval by QC manager.

The database and submittal management program will be extractable from the disk furnished to contractor, for operation on contractor's IBM compatible personal computer with 640kb RAM, a hard drive, and 3 1/2 inch high density floppy disk drive.

## 1.2 DEFINITIONS

## 1.2.1 Submittal

Shop drawings, product data, samples, operation and maintenance data, and administrative submittals presented for review and approval. Contract Clauses "FAR 52.236-5, Material and Workmanship," paragraph (b) and "FAR 52.236-21, Specifications and Drawings for Construction," paragraphs (d), (e), and (f) apply to all "submittals."

## 1.2.2 Types of Submittals

All submittals are classified as indicated in paragraph "Submittal Descriptions (SD)". Submittals also are grouped as follows:

- a. Shop drawings: As used in this section, drawings, schedules,

diagrams, and other data prepared specifically for this contract, by contractor or through contractor by way of subcontractor, manufacturer, supplier, distributor, or other lower tier contractor, to illustrate portion of work.

- b. Product data: Preprinted material such as illustrations, standard schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature, catalog data, and other data to illustrate portion of work, but not prepared exclusively for this contract.
- c. Samples: Physical examples of products, materials, equipment, assemblies, or workmanship that are physically identical to portion of work, illustrating portion of work or establishing standards for evaluating appearance of finished work or both.
- d. Operation and Maintenance (O&M) Data:  
Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item. The data is required when the item is delivered to the project site.
- e. Administrative submittals: Data presented for reviews and approval to ensure that administrative requirements of project are adequately met but not to ensure directly that work is in accordance with design concept and in compliance with contract documents.

### 1.3 SUBMITTAL IDENTIFICATION (SD)

Submittals required are identified by SD numbers and titles as follows:

#### SD-01 Preconstruction Submittals

Certificates of insurance.  
Surety bonds.  
List of proposed subcontractors.  
List of proposed products.  
Construction Progress Schedule.  
Submittal register.  
Schedule of values.  
Health and safety plan.  
Work plan.  
Quality control plan.  
Environmental protection plan.

#### SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

#### SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

#### SD-04 Samples

Physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

#### SD-05 Design Data

Calculations, mix designs, analyses or other data pertaining to a part of work.

#### SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)

Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports

Daily checklists

Final acceptance test and operational test procedure

#### SD-07 Certificates

Statements signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a supplier, installer or subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

Confined space entry permits.

#### SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and Material Safety Data sheets concerning impedances, hazards and safety precautions.

#### SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

Factory test reports.

#### SD-10 Operation and Maintenance Data

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

#### SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

### 1.3.1 Approving Authority

Person authorized to approve submittal.

### 1.3.2 Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be

incorporated in such construction.

#### 1.4 SUBMITTALS

Submit the following in accordance with the requirements of this section.

##### SD-01 Preconstruction Submittals

Submittal register; G

#### 1.5 USE OF SUBMITTAL REGISTER and/or DATABASE

Prepare and maintain submittal register, as the work progresses. Use electronic submittal register program furnished by the Government or any other format. Do not change data which is output in columns (c), (d), (e), and (f) as delivered by government; retain data which is output in columns (a), (g), (h), and (i) as approved.

##### 1.5.1 Submittal Register

Submit submittal register and/or as an electronic database, using submittals management program furnished to contractor. Submit with quality control plan and project schedule required by Section 01450N, "Quality Control" and/or Section 01321N, "Network Analysis Schedules." and/or Section 01320N, "Construction Progress Documentation." Do not change data in columns (c), (d), (e), and (f) as delivered by the government. Verify that all submittals required for project are listed and add missing submittals. Complete the following on the register and/or database :

Column (a) Activity Number: Activity number from the project schedule.

Column (g) Contractor Submit Date: Scheduled date for approving authority to receive submittals.

Column (h) Contractor Approval Date: Date contractor needs approval of submittal.

Column (i) Contractor Material: Date that contractor needs material delivered to contractor control.

##### 1.5.2 Contractor Use of Submittal Register

Update the following fields in the government-furnished submittal register program or equivalent fields in program utilized by contractor.

Column (b) Transmittal Number: Contractor assigned list of consecutive numbers.

Column (j) Action Code (k): Date of action used to record contractor's review when forwarding submittals to QC.

Column (l) List date of submittal transmission.

Column (q) List date approval received.

### 1.5.3 Approving Authority Use of Submittal Register

Update the following fields in the government-furnished submittal register program or equivalent fields in program utilized by contractor.

Column (b).

Column (l) List date of submittal receipt.

Column (m) through (p).

Column (q) List date returned to contractor.

### 1.5.4 Contractor Action Code and Action Code

Entries used will be as follows (others may be prescribed by Transmittal Form):

NR - Not Received

AN - Approved as noted

A - Approved

RR - Disapproved, Revise, and Resubmit

### 1.5.5 Copies Delivered to the Government

Deliver one copy of submitted register updated by contractor to government with each invoice request. Deliver in electronic format, unless a paper copy is requested by contracting officer.

## 1.6 PROCEDURES FOR SUBMITTALS

### 1.6.1 Reviewing, Certifying, Approving Authority

QC organization shall be responsible for reviewing and certifying that submittals are in compliance with contract requirements. Approving authority on submittals is QC manager unless otherwise specified for specific submittal. At each "Submittal" paragraph in individual specification sections, a notation "G," following a submittal item, indicates contracting officer is approving authority for that submittal item.

### 1.6.2 Constraints

- a. Submittals listed or specified in this contract shall conform to provisions of this section, unless explicitly stated otherwise.
- b. Submittals shall be complete for each definable feature of work; components of definable feature interrelated as a system shall be submitted at same time.

- c. When acceptability of a submittal is dependent on conditions, items, or materials included in separate subsequent submittals, submittal will be returned without review.
- d. Approval of a separate material, product, or component does not imply approval of assembly in which item functions.

#### 1.6.3 Scheduling

- a. Coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential requirements to resubmit.
- b. Except as specified otherwise, allow review period, beginning with receipt by approving authority, that includes at least 15 working days for submittals for QC Manager approval and 20 working days for submittals for contracting officer approval. Period of review for submittals with contracting officer approval begins when Government receives submittal from QC organization. Period of review for each resubmittal is the same as for initial submittal.
- c. For submittals requiring review by fire protection engineer, allow review period, beginning when government receives submittal from QC organization, of 30 working days for return of submittal to the contractor. Period of review for each resubmittal is the same as for initial submittal.

#### 1.6.4 Variations

Variations from contract requirements require Government approval pursuant to contract Clause entitled "FAR 52.236-21, Specifications and Drawings for Construction" and will be considered where advantageous to government.

##### 1.6.4.1 Considering Variations

Discussion with contracting officer prior to submission, will help ensure functional and quality requirements are met and minimize rejections and resubmittals. When contemplating a variation which results in lower cost, consider submission of the variation as a Value Engineering Change Proposal (VECP).

##### 1.6.4.2 Proposing Variations

When proposing variation, deliver written request to the contracting officer, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to government. If lower cost is a benefit, also include an estimate of the cost saving. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

##### 1.6.4.3 Warranting That Variations Are Compatible

When delivering a variation for approval, contractor warrants that this



contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

#### 1.6.4.4 Review Schedule Is Modified

In addition to normal submittal review period, a period of 10 working days will be allowed for consideration by the Government of submittals with variations.

#### 1.6.5 Contractor's Responsibilities

- a. Determine and verify field measurements, materials, field construction criteria; review each submittal; and check and coordinate each submittal with requirements of the work and contract documents.
- b. Transmit submittals to QC organization in accordance with schedule on approved Submittal Register, and to prevent delays in the work, delays to government, or delays to separate contractors.
- c. Advise contracting officer of variation, as required by paragraph entitled "Variations."
- d. Correct and resubmit submittal as directed by approving authority. When resubmitting disapproved transmittals or transmittals noted for resubmittal, the contractor shall provide copy of that previously submitted transmittal including all reviewer comments for use by approving authority. Direct specific attention in writing or on resubmitted submittal, to revisions not requested by approving authority on previous submissions.
- e. Furnish additional copies of submittal when requested by contracting officer, to a limit of 20 copies per submittal.
- f. Complete work which must be accomplished as basis of a submittal in time to allow submittal to occur as scheduled.
- g. Ensure no work has begun until submittals for that work have been returned as "approved," or "approved as noted", except to the extent that a portion of work must be accomplished as basis of submittal.

#### 1.6.6 QC Organization Responsibilities

- a. Note date on which submittal was received from contractor on each submittal.
- b. Review each submittal; and check and coordinate each submittal with requirements of work and contract documents.
- c. Review submittals for conformance with project design concepts and compliance with contract documents.
- d. Act on submittals, determining appropriate action based on QC

organization's review of submittal.

(1) When QC manager is approving authority, take appropriate action on submittal from the possible actions defined in paragraph entitled, "Actions Possible."

(2) When contracting officer is approving authority or when variation has been proposed, forward submittal to Government with certifying statement or return submittal marked "not reviewed" or "revise and resubmit" as appropriate. The QC organization's review of submittal determines appropriate action.

e. Ensure that material is clearly legible.

f. Stamp each sheet of each submittal with QC certifying statement or approving statement, except that data submitted in bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only.

(1) When approving authority is contracting officer, QC organization will certify submittals forwarded to contracting officer with the following certifying statement:

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated with contract Number \_\_\_\_\_, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is submitted for Government approval.

Certified by Submittal Reviewer \_\_\_\_\_, Date \_\_\_\_\_  
(Signature when applicable)

Certified by QC Manager \_\_\_\_\_, Date \_\_\_\_\_"  
(Signature)

(2) When approving authority is QC Manager, QC Manager will use the following approval statement when returning submittals to contractor as "Approved" or "Approved as Noted."

"I hereby certify that the (material) (equipment) (article) shown and marked in this submittal and proposed to be incorporated with contract Number \_\_\_\_\_, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is \_\_\_\_\_ approved for use.

Certified by Submittal Reviewer \_\_\_\_\_, Date \_\_\_\_\_  
(Signature when applicable)

Approved by QC Manager \_\_\_\_\_, Date \_\_\_\_\_"  
(Signature)

g. Sign certifying statement or approval statement. The person signing certifying statements shall be QC organization member designated in the approved QC plan. The signatures shall be in

original ink. Stamped signatures are not acceptable.

- h. Update submittal register and/or database as submittal actions occur and maintain the submittal register at project site until final acceptance of all work by contracting officer.
- i. Retain a copy of approved submittals at project site, including contractor's copy of approved samples.

#### 1.6.7 Government's Responsibilities

When approving authority is Contracting Officer, the Government will:

- a. Note date on which submittal was received from QC manager, on each submittal for which the contracting officer is approving authority.
- b. Review submittals for approval within scheduling period specified and only for conformance with project design concepts and compliance with contract documents.
- c. Identify returned submittals with one of the actions defined in paragraph entitled "Actions Possible" and with markings appropriate for action indicated.

#### 1.6.8 Actions Possible

Submittals will be returned with one of the following notations:

- a. Submittals marked "not reviewed" will indicate submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by contractor or for being incomplete, with appropriate action, coordination, or change.
- b. Submittals marked "approved" "approved as submitted" authorize contractor to proceed with work covered.
- c. Submittals marked "approved as noted" or "approval except as noted; resubmission not required" authorize contractor to proceed with work as noted provided contractor takes no exception to the notations.
- d. Submittals marked "revise and resubmit" or "disapproved" indicate submittal is incomplete or does not comply with design concept or requirements of the contract documents and shall be resubmitted with appropriate changes. No work shall proceed for this item until resubmittal is approved.

#### 1.7 FORMAT OF SUBMITTALS

##### 1.7.1 Transmittal Form

Transmit each submittal, except sample installations and sample panels, to office of approving authority. Transmit submittals with transmittal form prescribed by Contracting Officer and standard for project. The transmittal form shall identify Contractor, indicate date of submittal, and include information prescribed by transmittal form and required in paragraph entitled "Identifying Submittals." Process transmittal forms to record actions regarding sample panels and sample installations.

#### 1.7.2 Identifying Submittals

Identify submittals, except sample panel and sample installation, with the following information permanently adhered to or noted on each separate component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

- a. Project title and location.
- b. Construction contract number.
- c. Section number of the specification section by which submittal is required.
- d. Submittal description (SD) number of each component of submittal.
- e. When a resubmission, add alphabetic suffix on submittal description, for example, SD-10A, to indicate resubmission.
- f. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other second tier contractor associated with submittal.
- g. Product identification and location in project.

#### 1.7.3 Format for Shop Drawings

- a. Shop drawings shall not be less than 8 1/2 by 11 inches nor more than 30 by 42 inches.
- b. Present 8 1/2 by 11 inches sized shop drawings as part of the bound volume for submittals required by section. Present larger drawings in sets.
- c. Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph entitled "Identifying Submittals."
- d. Dimension drawings, except diagrams and schematic drawings; prepare drawings demonstrating interface with other trades to scale. Shop drawing dimensions shall be the same unit of measure as indicated on the contract drawings. Identify materials and products for work shown.

#### 1.7.4 Format of Product Data

- a. Present product data submittals for each section as a complete, bound volume. Include table of contents, listing page and catalog item numbers for product data.
- b. Indicate, by prominent notation, each product which is being submitted; indicate specification section number and paragraph number to which it pertains.
- c. Supplement product data with material prepared for project to satisfy submittal requirements for which product data does not exist. Identify this material as developed specifically for project.

#### 1.7.5 Format of Samples

- a. Furnish samples in sizes below, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately same size as specified:
  - (1) Sample of Equipment or Device: Full size.
  - (2) Sample of Materials Less Than 2 by 3 inches: Built up to 8 1/2 by 11 inches.
  - (3) Sample of Materials Exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.
  - (4) Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.
  - (5) Sample of Non-Solid Materials: Pint. Examples of non-solid materials are sand and paint.
  - (6) Color Selection Samples: 2 by 4 inches.
  - (7) Sample Panel: 4 by 4 feet.
  - (8) Sample Installation: 100 square feet.
- b. Samples Showing Range of Variation: Where variations are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range.
- c. Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples shall be in undamaged condition at time of use.
- d. Recording of Sample Installation: Note and preserve the notation of area constituting sample installation but remove notation at final clean up of project.
- e. When color, texture or pattern is specified by naming a particular

manufacturer and style, include one sample of that manufacturer and style, for comparison.

1.7.6 Format of Operation and Maintenance (O&M) Data

- a. O&M Data format shall comply with the requirements specified in Section 01781, Operation and Maintenance Data"

1.7.7 Format of Administrative Submittals

- a. When submittal includes a document which is to be used in project or become part of project record, other than as a submittal, do not apply contractor's approval stamp to document, but to a separate sheet accompanying document.

1.8 QUANTITY OF SUBMITTALS

1.8.1 Number of Copies of Shop Drawings

- a. Submit six copies of submittals of shop drawings requiring review and approval only by QC organization and seven copies of shop drawings requiring review and approval by Contracting Officer.

1.8.2 Number of Copies of Product Data

Submit product data in compliance with quantity requirements specified for shop drawings.

1.8.3 Number of Samples

- a. Submit two samples, or two sets of samples showing range of variation, of each required item. One approved sample or set of samples will be retained by approving authority and one will be returned to contractor.
- b. Submit one sample panel. Include components listed in technical section or as directed.
- c. Submit one sample installation, where directed.
- d. Submit one sample of non-solid materials.

1.8.4 Number of Copies of Operation and Maintenance Data

Submit Five copies of O&M Data to the Contracting Officer for review and approval

1.8.5 Number of Copies of Administrative Submittals

- a. Unless otherwise specified, submit administrative submittals compliance with quantity requirements specified for shop drawings.

1.9 FORWARDING SUBMITTALS

### 1.9.1 Submittals Required from the Contractor

As soon as practicable after award of contract, and before procurement of fabrication, forward to the Commander, LANTNAVFACENGCOM, Code CI4A1, 1510 Gilbert Street, Norfolk, Virginia, 23511-2699 and/or to the appropriate Architect-Engineer, submittals required in the technical sections of this specification, including shop drawings, product data and samples. One copy of the transmittal form for all submittals shall be forwarded to the Resident Officer in Charge of Construction.

The Architect-Engineer for this project and/or LANTNAVFACENGCOM will review and provide surveillance for the Contracting Officer to verify Contractor-approved submittals comply with the contract requirements.

The Architect-Engineer for this project and/or LANTNAVFACENGCOM will review and approve for the Contracting Officer those submittals reserved for Contracting Officer approval to verify submittals comply with the contract requirements.

#### 1.9.1.1 O&M Data

The Architect-Engineer for this project and/or LANTNAVFACENGCOM will review and approve for the Contracting Officer O&M Data to verify the submittals comply with the contract requirements.; submit data specified for a given item within 30 calendar days after the item is delivered to the contract site.

- a. In the event the Contractor fails to deliver O&M Data within the time limits specified, the Contracting Officer may withhold from progress payments 50 percent of the price of the item with which such O&M Data are applicable.

#### 1.9.1.2 Submittals Reserved for LANTNAVFACENGCOM Approval

As an exception to the standard submittal procedure specified above, submit the following to the Commander, LANTNAVFACENGCOM, Code CI4A1, 1510 Gilbert Street, Norfolk, Virginia 23511-2699:

- a. Section 15901, "Space Temperature Control Systems": SD-06 field test report submittals
- b. Section 15910N, "Direct Digital Control Systems": SD-06 field test report submittals
- c. Section 15950N, "HVAC Testing/Adjusting/Balancing": All submittals
- d. Section 15951N, "Testing Industrial Ventilation Systems": All submittals
- e. Section 16272N, "Three-Phase Pad Mounted Transformers": All submittals
- f. Section 16273N, "Single-Phase Pad Mounted Transformers": All

## submittals

g. Section 16301N, "Overhead Transmission and Distribution":  
Transformer submittals

h. Section 16360N, "Secondary Unit Substations": Transformer  
submittals

i. Section 16361N, "Primary Unit Substations": Transformer submittals

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## 1.9.1.3 Overseas Shop Drawing Submittals

All submittals shall be sent via overnight express mail service. All costs associated with the overnight express mail service shall be borne by the construction contractor. Costs associated with the overnight express mail of submittals related to proposed submittal variances of resubmittals necessary as a result of noncompliant or incomplete contractor submittals shall be the responsibility of the contractor.

## 1.10 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

## 1.10.1 Designer of Record Approved

Designer of Record approval is required for extensions of design, critical materials, any deviations from the solicitation, the accepted proposal, or the completed design, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings". The Contractor shall provide the Government the number of copies designated hereinafter of all Designer of Record approved submittals. The Government may review any or all Designer of Record approved submittals for conformance to the Solicitation and Accepted Proposal. The Government will review all submittals designated as deviating from the Solicitation or Accepted Proposal, as described below. Design submittals shall be in accordance with Section 01012 DESIGN AFTER AWARD. Generally, design submittals should be identified as SD-05 DESIGN DATA submittals.

## 1.10.2 Government Approved

Government approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Government approval is required for any deviations from the Solicitation or Accepted Proposal and other items as designated by the Contracting Officer.

Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

## 1.10.3 Government Reviewed Design or Extension of Design

The Government will review all ( \_\_\_\_%) and ( \_\_\_\_%) design submittals for conformance with the technical requirements of the solicitation. Section



01012 DESIGN AFTER AWARD covers the design submittal and review process in detail. Government review is required for extension of design construction submittals, used to define contract conformity, and for deviation from the completed design. Review will be only for conformance with the contract requirements. Included are only those construction submittals for which the Designer of Record design documents do not include enough detail to ascertain contract compliance. The Government may, but is not required, to review extensions of design such as structural steel or reinforcement shop drawings.

#### 1.10.4 Information Only

All submittals not requiring Government approval will be for information only. All submittals not requiring Designer of Record or Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above. All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

#### 1.11 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory design, general method of construction, materials, detailing and other information appear to meet the Solicitation and Accepted Proposal. Approval will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work and/or design, dimensions, all design extensions, such as the design of adequate connections and details, etc., and the satisfactory construction of all work. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

#### 1.12 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. The Contractor shall make all corrections required by the Contracting Officer, obtain the Designer of Record's approval when applicable, and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. Any "information only" submittal found to contain errors or unapproved deviations from the Solicitation or Accepted Proposal shall be resubmitted as one requiring "approval" action, requiring both Designer of Record and Government approval. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

### 1.13 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained. No payment for materials incorporated in the work will be made if all required Designer of Record or required Government approvals have not been obtained. No payment will be made for any materials incorporated into the work for any conformance review submittals or information only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

### 1.14 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) System Manager and the Designer of Record, if applicable, and each item shall be stamped, signed, and dated by the CQC System Manager indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

### 1.15 SUBMITTAL REGISTER

At the end of this section is a submittal register or list showing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The Contractor shall maintain a submittal register for the project in accordance with Section 01312A QUALITY CONTROL SYSTEM (QCS) or the Government will provide the initial submittal register in electronic format. Thereafter, the Contractor shall maintain a complete list of all submittals, including completion of all data columns. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall track all submittals.

The Designer of Record shall develop a complete list of submittals during design. The Designer of Record shall identify required submittals in the specifications, and use the list to prepare the Submittal Register. The list may not be all inclusive and additional submittals may be required

by other parts of the contract. The Contractor is required to complete the submittal register and submit it to the Contracting Officer for approval within 30 calendar days after Notice to Proceed. The approved submittal register will serve as a scheduling document for submittals and will be used to control submittal actions throughout the contract period. The submit dates and need dates used in the submittal register shall be coordinated with dates in the Contractor prepared progress schedule. Updates to the submittal register showing the Contractor action codes and actual dates with Government action codes and actual dates shall be submitted monthly or until all submittals have been satisfactorily completed. When the progress schedule is revised, the submittal register shall also be revised and both submitted for approval.

#### 1.16 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 15 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals. An additional 15 calendar days shall be allowed and shown on the register for review and approval of submittals for food service equipment and refrigeration and HVAC control systems.

#### 1.17 TRANSMITTAL FORM (ENG FORM 4025)

The sample transmittal form (ENG Form 4025) attached to this section shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor and are included in the QCS software that the Contractor is required to use for this contract. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

#### 1.18 SUBMITTAL PROCEDURES

Submittals shall be made as follows:

##### 1.18.1 Procedures

The Government will further discuss detailed submittal procedures with the Contractor at the Preconstruction Conference or at the Post-Award Conference.

##### 1.18.2 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the

right to rescind inadvertent approval of submittals containing unnoted deviations.

#### 1.19 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

#### 1.20 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. Six copies of the submittal will be retained by the Contracting Officer and six copies of the submittal will be returned to the Contractor. If the Government performs a conformance review of other Designer of Record approved submittals, the submittals will be so identified and returned, as described above.

#### 1.21 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe. For design-build construction the Government will retain four copies of information only submittals.

#### 1.22 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

CONTRACTOR
(Firm Name)
_____ Approved
_____ Approved with corrections as noted on submittal data and/or attached sheets(s).
SIGNATURE: _____
TITLE: _____
DATE: _____

For design-build construction, both the Contractor Quality Control System Manager and the Designer of Record shall stamp and sign to certify that the submittal meets contract requirements.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

## SECTION 01354

ENVIRONMENTAL PROTECTION FOR CIVIL WORKS  
10/95

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z358.1 (1990) Emergency Eyewash and Shower Equipment

## CODE OF FEDERAL REGULATIONS (CFR)

10 CFR 20 Standards for Protection Against Radiation

29 CFR 1904 Recording and Reporting Occupational Injuries and Illnesses

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1926 Safety and Health Regulations for Construction

49 CFR 172 Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

## ENGINEERING MANUALS (EM)

EM 385-1-1 (1996) U.S. Army Corps on Engineers Safety and Health Requirements Manual

## NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

NIOSH Pub No. 85-115 (1985) Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities

## 1.2 DEFINITIONS

Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents that adversely affect human health or welfare; unfavorably alter ecological balances of plant or animal

communities; or degrade the environment from an aesthetic, cultural or historic perspective. Environmental protection is the prevention/control of pollution and habitat disruption that may occur during construction. The control of environmental pollution and damage requires consideration of air, water, land, biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive materials; and other pollutants.

### 1.3 SUBMITTALS

Government approval is required for all submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-06 Test Reports

Confirmation Sampling and Analysis; G AE.

Sampling Liquid; G AE.

#### SD-08 Statements

Environmental Protection Plan; G AE.

Submit plan detailing Contractor's procedures for environmental protection; GA A.

Site Safety and Health Plan (SSHP); G AE.

The Site Safety and Health Plan (SSHP) shall be submitted within 30 calendar days after notice to proceed. No work at the site shall be performed until the SSHP is approved. The Contractor shall allow 30 calendar days in the schedule for the Government's review. No adjustment for time or money will be made if resubmittals of the SSHP Plan are required due to deficiencies in the plan.

Safety and Health Manager; G AE.

Activity Hazard Analysis; G AE.

Persons Certified in First Aid and CPR.

Emergency Response Plan; G AE.

Safety and Health Phase-out Report; G AE.

12 copies of Safety and Health Phase-out Report shall be submitted within 14 calendar days of work completion at the site.

Excavation and Handling Work Plan; G AE.

Work Plan within 30 calendar days after notice to proceed. No work at the site, with the exception of site inspections and surveys, shall be

performed until the Work Plan is approved. The Contractor shall allow 30 calendar days in the schedule for the Government's review. No adjustment for time or money will be made if resubmittals of the Work Plan are required due to deficiencies in the plan. At a minimum, the Work Plan shall include:

- a. Schedule of activities.
- b. Method of excavation and equipment to be used.
- c. Dewatering Plan.
- d. Storage methods and locations for liquid and solid contaminated material.
- e. Borrow sources and haul routes.
- f. Decontamination procedures.
- g. Spill contingency plan.

Quality Control Plan; G AE.

Final Remedial Action Report; G AE.

12 copies of a Final Remedial Action Report shall be prepared and submitted within 14 calendar days of completing work at the site.

### 1.3 ENVIRONMENTAL PROTECTION REQUIREMENTS

General the Contractor shall comply with all applicable Federal, State, and local laws and regulations. The Contractor shall provide environmental protective measures and procedures to prevent and control pollution, limit habitat disruption, and correct environmental damage that occurs during construction. The Contractor shall at all times perform all work and take such steps required to prevent any interference or disturbance to fish and wildlife.

#### 1.3.1 Protection of Features

This section supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (APR 1984). The Contractor shall prepare a list of features requiring protection under the provisions of the contract clause which are not specially identified on the drawings as environmental features requiring protection. The Contractor shall protect those environmental features, indicated specially on the drawings, in spite of interference which their preservation may cause to the Contractor's work under the contract.

#### 1.3.2 Permits

The Contractor shall comply with all applicable Federal, State and local laws and regulation. The Government has obtained Water Quality Certification, and Stream Encroachment and Freshwater Wetlands permits (Section 00903). The Contractor shall also comply with the terms, and condition of these permits. The Contractor shall also comply with other environmental commitments made by the Government.

#### 1.3.3 Special Environmental Requirements



The Contractor shall comply with the special environmental requirements included at the end of this section. These special environmental requirements are an outgrowth of environmental commitments made by the Government during the project development.

#### 1.3.4 Environmental Assessment of Contract Deviations

The Contract specifications have been prepared to comply with the special conditions and mitigation measures of an environmental nature which were established during the planning and development of this project. The Contractor is advised that deviations from the drawings or specifications (e.g., proposed alternate borrow areas, disposal areas, staging areas, alternate access routes, etc.) could result in the requirement for the Government to reanalyze the project from an environmental standpoint. Deviations from the construction methods and procedures indicated by the plans and specifications which may have an environmental impact will require an extended review, processing, and approval time by the Government. The Contracting Officer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Contracting Officer determines that the proposed alternate method will have an adverse environmental impact.

#### 1.4 ENVIRONMENTAL PROTECTION PLAN

Within 20 calendar days of Notice of Award, the Contractor shall submit an Environmental Protection Plan for review and acceptance by the Contracting Officer. The Government will consider an interim plan for the first 30 days of operations. However, the Contractor shall furnish an acceptable final plan not later than 30 calendar days after receipt of the Notice to Proceed. Acceptance is conditional and is predicated upon satisfactory performance during construction. The Government reserves the right to require the Contractor to make changes in the Environmental Protection Plan or operations if the Contracting Officer determines that environmental protection requirements are not being met. No physical work at the site shall begin prior to acceptance of the Contractor's plan or an interim plan covering the work to be performed. The environmental protection plan shall include, but not be limited to, the following:

##### 1.4.1 List of State and Local Laws and Regulations

The Contractor shall provide as part of the Environmental Protection Plan a list of all State and local environmental laws and regulations which apply to the construction operations under the Contract. The plan shall detail the action which the contractor shall take to comply with all applicable Federal, State and local laws and regulation concerning environmental protection and pollution control and abatement, as well as the additional specific requirements of the contract.

##### 1.4.2 Spill Control Plan

The Contractor shall include as part of the environmental protection plan, a Spill Control Plan. The plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance

regulated by the Emergency Response and Community Right-to-Know Act or regulated under State or local laws or regulations. The Spill Control Plan supplements the requirements of EM 385-1-1. This plan shall include as a minimum:

- a. The name of the individual who will be responsible for implementing and supervising the containment and cleanup.
- b. Training requirements for Contractor's personnel and methods of accomplishing the training.
- c. A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.
- d. The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency.
- e. The methods and procedures to be used for expeditious contaminant cleanup.
- f. The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Contracting Officer in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity spill occurs. The plan shall contain a list of the required reporting channels and telephone numbers.

#### 1.4.3 Recycling and Waste Minimization Plan

The Contractor shall submit a Recycling and Waste Minimization Plan as a part of the Environmental Protection Plan. The plan shall detail the Contractor's actions to comply with the following recycling and waste minimization requirements:

- a. The Contractor shall participate in State and local government sponsored recycling programs to reduce the volume of solid waste materials at the source.

#### 1.4.4 Contaminant Prevention Plan

As a part of the Environmental Protection Plan, the Contractor shall prepare a contaminant prevention statement identifying potentially hazardous substances to be used on the job site and intended actions to prevent accidental or intentional introduction of such materials into the air, water, or ground. The Contractor shall detail provisions to be taken to meet Federal, State, and local laws and regulations regarding the storage and handling of these materials.

#### 1.4.5 Environmental Monitoring

The Contractor shall include in the plan the details of environmental monitoring requirements under the laws and regulations and a description of how this monitoring will be accomplished.

#### 1.5 SITE SAFETY AND HEALTH PLAN

Work performed under this contract shall comply with EM 385-1-1, applicable Federal, State, and local safety and occupational health laws and regulations. This includes, but is not limited to, Occupational Safety and Health Administration (OSHA) standards, 29 CFR 1910, Section 120. Matters of interpretation of standards shall be submitted to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.

##### 1.5.1 Safety and Health Program

OSHA Standards 29 CFR 1910, Section 120(b) and 29 CFR 1926, Section 65(b) requirement employers to develop and implement a written Safety and Health Program for all employees. The site-specific program requirements of the OSHA Standards shall be integrated into one site-specific document, the Site Safety and Health Plan (SSHP). The SSHP shall interfere with the employer's overall Safety and Health Program. Any portions of the overall Safety and Health Program that are referenced in the SSHP shall be included as appendices to the SSHP.

##### 1.5.2 Preparation and Implementation

A Site Safety and Health Plan (SSHP) shall be prepared covering onsite work to be performed by the Contractor and all subcontractors. The Safety and Health Manager shall be responsible for the development, implementation and oversight of the SSHP. The SSHP shall establish, in detail, the protocols necessary for the anticipation, recognition, evaluation, and control of hazards associated with each task performed. The SSHP shall address site-specific safety and health requirements and procedures based upon site-specific conditions. The level of detail provided in the SSHP shall be tailored to the type of work, complexity of operations to be performed, and hazards anticipated. Details about some activities may not be available when the initial SSHP is prepared and submitted. Therefore, the SSHP shall address, in as much detail as possible, anticipated tasks, their related hazards and anticipated control measures. Additional details shall be included in the hazard analyses as described in paragraph HAZARD ANALYSES of Section 01420 SAFETY.

##### 1.5.3 Acceptance and Modifications

Prior to submittal, the SSHP shall be signed and dated by the Safety and Health Manager and the Site Superintendent. The SSHP shall be submitted for review 14 calendar days prior to the Pre-Construction Safety Conference. Deficiencies in the SSHP will be discussed at the Pre-Construction Safety Conference, and the SSHP shall be revised to correct the deficiencies and resubmitted for acceptance. Onsite work shall not begin until the plan has been accepted. A copy of the written SSHP shall

be maintained onsite. As work proceeds, the SSHP shall be adapted to new situations and new conditions. Changes and modifications to the accepted SSHP shall be made with the knowledge and concurrence of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer. Should any unforeseen hazard become evident during the performance of the work, the Safety and Health Manager shall bring such hazard to the attention of the Site Superintendent, and the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, necessary action shall be taken to re-establish and maintain safe working conditions in order to safeguard onsite personnel, the public, and the environment. Disregard for the provisions of this specification or the accepted SSHP shall be cause for stopping of work until the matter has been rectified.

#### 1.5.4 Availability

The SSHP shall be made available in accordance with 29 CFR 1910, Section 120 (b)(1)(v) and 29 CFR 1926, Section 65 (b)(1)(v).

#### 1.5.5 Elements

Topics required by 29 CFR 1910, Section 120 (b)(4) 29 CFR 1926, Section 65 (b)(4) and the Accident Prevention Plan as described in Appendix A of EM 385-1-1 and those described in this section shall be addressed in the SSHP. Where the use of a specific topic is not applicable to the project, the SSHP shall include a statement to justify its omission or reduced level of detail and establish that adequate consideration was given the topic.

### 1.6 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

#### 1.6.1 Plan Requirements

The SSHP shall include a site description and contamination characterization section that addresses the following elements:

- a. Description of site location, topography, size and past uses of the site.
- b. A list of contaminants which may present occupational health and safety hazards. This list shall be created by evaluating the analytical results in this section and by researching sources of information from past site investigation activities. Chemical names, concentration ranges, media in which found, locations onsite, and estimated quantities/volumes to be impacted by site work shall be included if known. The contamination characterization shall be reviewed and revised if new chemicals are identified as work progresses.

### 1.7 HAZARD ANALYSIS

Hazard Analysis shall be performed as specified in Section 01420 SAFETY.

### 1.8 ACTIVITY HAZARD ANALYSES

Prior to beginning each major phase of work, an Activity Hazard Analysis

shall be prepared by the Contractor performing that work and submitted for review and acceptance. The format shall be in accordance with EM 385-1-1, figure 1-1. A major phase of work is defined as an operation involving a type of work presenting hazards not experienced in previous operations or where a new subcontractor or work crew is to perform. The analysis shall define the activities to be performed and identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the activity hazard analysis has been accepted and a preparatory meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activities, including the government onsite representatives. The activity hazard analyses shall be continuously reviewed and when appropriate modified to address changing site conditions or operations, with the concurrence of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer. Activity hazard analyses shall be attached to and become a part of the SSHP. The Contractor shall comply with the activity hazard analyses requirements in Section 01420 SAFETY.

#### 1.9 ACCIDENT PREVENTION PLAN

The Accident Prevention Plan (APP) shall conform to Section 01420 SAFETY. The APP is further detailed as follows:

##### 1.9.1 Preparation and Implementation

The Accident Prevention Plan (APP) shall conform to Section 01420 SAFETY. The APP is further detailed as follows:

The APP shall be prepared in accordance with EM 385-1-1, Table 1-1. Where a topic in table 1-1 is not applicable, the APP shall justify its omission or reduced level of detail, and establish that adequate consideration was given to the topic. The APP shall cover onsite work by the Contractor or subcontractors. The Safety and Health Manager shall prepare and be responsible implementation and quality control of the content and actions required in the APP. For each anticipated work task, the APP shall establish hazards and control measures. The APP shall be updated as unanticipated events warrant amendment of the APP. The APP shall be easily readable and understandable by the Contractor's work force.

##### 1.9.2 Acceptance and Modifications

The APP shall be prepared, signed and dated by the Safety and Health Manager. Deficiencies in the APP shall be discussed at the Pre-construction Safety Conference and the APP shall be revised to correct the deficiencies, and resubmitted for acceptance. Onsite work shall not begin until the APP has been accepted unless otherwise authorized in writing by the Contracting Officer. One copy of the APP shall be maintained in the Contractor's jobsite file, and a second copy shall be posted where it will be accessible to personnel on the site. As work proceeds, the APP shall be adapted to new situations and conditions. Changes to the APP shall be made with concurrence of the Safety and Health Manager and Site Superintendent, and approved by the Contracting Officer. Should an unforeseen hazard become evident during performance of the work, the Safety and Health Manager shall

bring such hazard to the attention of the Superintendent and the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, the Contractor shall take necessary action to re-establish and maintain safe working conditions; and to safeguard onsite personnel, visitors, the public, and the environment. Disregard for provisions of this specification, or the accepted APP shall be cause for stopping of work until the matter is rectified.

#### 1.9.3 Activity Hazard Analyses

Activity Hazard Analyses shall conform to this Section, see paragraph Activity Hazard Analyses above.

#### 1.10 STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

An organizational structure shall be developed that sets forth lines of authority (chain of command), responsibilities, and communication procedures concerning site safety, health, and emergency response. This organizational structure shall cover management, supervisors and employees of the Contractor and subcontractors. The structure shall include the means for coordinating and controlling work activities of subcontractors and suppliers. The SSHP shall include a description of this organizational structure as well as qualifications and responsibilities of each of the following individuals. The Contractor shall obtain Contracting Officer's acceptance before replacing the Safety and Health Manager. Requests shall include the names, qualifications, duties, and responsibilities of each proposed replacement.

##### 1.10.1 Site Superintendent

A Site Superintendent, who has responsibility to implement the SSHP, the authority to direct work performed under this contract and verify compliance, shall be designated.

##### 1.10.2 Safety and Health Manager

The Safety and Health Manager as used in this Section may be the same person as the Site Safety Officer as used in Section 01420 SAFETY. These two names may be interchangeable and may apply to only one staff officer.

##### 1.10.3 Persons Certified in First Aid and CPR

At least two persons who are currently certified in first aid and CPR by the American Red Cross or other approved agency shall be onsite at all times during site operations. They shall be trained in universal precautions and the use of Personal Protective and Safety Equipment as specified EM 385-1-1. These persons may perform other duties but shall be immediately available to render first aid when needed.

#### 1.11 TRAINING

Personnel shall receive training in accordance with the Contractor's written safety and health training program. The SSHP shall include a section describing training requirements.

#### 1.11.1 Site-specific Training

Site-specific training sessions shall comply with EM 385-1-1.

#### 1.11.2 Periodic Sessions

Periodic onsite training shall be conducted by the Safety and Health Manager prior to personnel assigned to tasks for the first time. The training shall address safety and health procedures, work practices, any changes in the SSHP, hazard analyses, work tasks, schedule, or review of safety discrepancies and accidents.

#### 1.12 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

The Safety and Health Manager shall prepare and implement an exposure monitoring/air sampling program to identify and quantify safety and health hazards and airborne levels of hazardous substances in order to assure proper selection of engineering controls, work practices and personal protective equipment (PPE) for affected site personnel. Available site information shall be reviewed and the exposure monitoring/air sampling program shall be expanded and/or revised to reflect new or changing site conditions or information. The expanded and/or revised requirements shall be submitted and approved as part of the updated SSHP.

#### 1.13 SAFETY PROCEDURES, ENGINEERING CONTROLS AND WORK PRACTICES

The SSHP shall describe the standard operating safety procedures, engineering controls and safe work practices to be implemented for the work covered. The descriptions shall address the work tasks as identified in FOCUS AREAS of Section 01420 SAFETY.

#### 1.14 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

The SSHP shall describe the emergency and first aid equipment to be made available onsite. The following items, as a minimum, shall be maintained onsite and available for immediate use:

- a. First aid equipment and supplies as approved by consulting physician acceptable to the Contracting Officer.
- b. Emergency eyewashes and showers which comply with ANSI Z358.1.
- c. Emergency-use respirators. For rescue purposes, 2 positive pressure self-contained breathing apparatus (SCBA) shall be supplied. These shall be dedicated for emergency use only and maintained onsite at a location approved by the Contracting Officer.
- d. Fire extinguishers with a minimum rating of 20-A:120-B:C shall be provided at site locations where flammable or combustible materials present a fire risk.

#### 1.15 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

An Emergency Response Plan, that meets the requirements of 29 CFR 1910 Section 120 (1) and 29 CFR 1926 Section 65 (1), shall be developed and implemented as a section of the SSHP. In the event of any emergency associated with remedial action, the Contractor shall, without delay, alert all onsite employees that there is an emergency situation; take action to remove or otherwise minimize the cause of the emergency; alert the Contracting Officer; and institute measures necessary to prevent repetition of the conditions or actions leading to, or resulting in, the emergency. Employees that are required to respond to hazardous emergency situations shall be trained in how to respond to such expected emergencies. The plan shall be rehearsed regularly as part of the overall training program for site operations. The plan shall be reviewed periodically and revised as necessary to reflect new or changing site conditions or information. Copies of the accepted SSHP and revisions shall be provided to the affected local emergency response agencies. The following elements, as a minimum, shall be addressed in the plan:

- a. Pre-emergency planning. The local emergency response agencies shall be contacted and met with during preparation of the Emergency Response Plan. Agencies to be contacted include local fire, police, and rescue authorities with jurisdiction and nearby medical facilities that may be utilized for emergency treatment of injured personnel. At these meetings, the agencies shall be notified of upcoming site activities and potential emergency situations. The response agencies' capabilities shall be ascertained and written response commitments obtained. The Contractor shall ensure the Emergency Response Plan for the site is compatible and integrated with disaster, fire and/or emergency response plans of local, state, and Federal agencies.
- b. Personnel roles, lines of authority, communications for emergencies.
- c. Emergency recognition and prevention.
- d. Site topography, layout, and prevailing weather conditions.
- e. Specific procedures for medical treatment of injured personnel.
- f. Route maps to nearest medical facility. Site-support vehicles shall be equipped with maps. At the beginning of project operations, drivers of the support vehicles shall become familiar with the emergency route and the travel time required.
- g. Emergency alerting and response procedures including posted instructions and a list of names and telephone numbers of emergency contacts (physician, nearby medical facility, fire and police departments, ambulance service, Federal, state, and local environmental agencies; as well as Safety and Health Manager, the Site Superintendent, the Contracting Officer and/or their alternates).
- h. Criteria for initiating community alert program, contacts, and responsibilities.
- i. Procedures for reporting incidents to appropriate government agencies. In the event that an incident such as an explosion or fire, or a spill or



release of toxic materials occurs during the course of the project, the appropriate government agencies shall be immediately notified. In addition, the Contracting Officer shall be verbally notified immediately and receive a written notification within 24 hours. The report shall include the following items:

- (1) Name, organization, telephone number, and location of the Contractor.
- (2) Name and title of the person(s) reporting.
- (3) Date and time of the incident.
- (4) Location of the incident, i.e., site location, facility name.
- (5) Brief summary of the incident giving pertinent details including type of operation ongoing at the time of the incident.
- (6) Cause of the incident, if known.
- (7) Casualties (fatalities, disabling injuries).
- (8) Details of any existing chemical hazard or contamination.
- (9) Estimated property damage, if applicable.
- (10) Nature of damage, effect on contract schedule.
- (11) Action taken to ensure safety and security.
- (12) Other damage or injuries sustained, public or private.

k. Procedures for critique of emergency responses and follow-up.

#### 1.16 INSPECTIONS

The SSHO shall perform daily inspections of the jobsite and the work in progress to ensure compliance with EM 385-1-1, the Safety and Health Program, the SSHP and other occupational health and safety requirements of the contract, and to determine the effectiveness of the SSHP. Procedures for correcting deficiencies (including actions, timetable and responsibilities) shall be described in the SSHP. Follow-up inspections to ensure correction of deficiencies shall be conducted and documented. Daily safety inspection logs shall be used to document the inspections, noting safety and health deficiencies, deficiencies in the effectiveness of the SSHP, and corrective actions taken. In the event of an accident, the Contracting Officer shall be notified according to EM 385-1-1. Within 2 working days of any reportable accident, an Accident Report shall be completed on ENG Form 3394 and submitted.

#### 1.17 SAFETY AND HEALTH PHASE-OUT REPORT

A Safety and Health Phase-Out Report shall be submitted prior to final acceptance of the work. The following minimum information shall be included:

- a. Summary of the overall performance of safety and health (accidents or incidents including near misses, unusual events, lessons learned, etc.).
- b. Final decontamination documentation including procedures and techniques used to decontaminate equipment, vehicles, and on site facilities.
- c. Summary of exposure monitoring and air sampling accomplished during the project.
- d. Signatures of Safety and Health Manager and SSHO.

## PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

### 3.1 SPECIAL ENVIRONMENTAL PROTECTION REQUIREMENTS

#### 3.1.1 Tree Protection

No ropes, cables, or guys shall be fastened to or attached to any tree(s) for anchorage unless specifically authorized by the Contracting Officer. Where such special use is permitted, the Contractor shall provide effective protection to prevent damage to the tree and other land and vegetative resources. Unless specifically authorized by the Contracting Officer, no construction equipment or materials shall be placed or used within the drip line of trees shown on the drawings to be saved. No excavation or fill shall be permitted within the drip line of trees to be saved except as shown on the drawings.

#### 3.1.2 U.S. Department of Agriculture (USDA) Quarantined Considerations

The Contractor shall thoroughly clean all construction equipment at the prior job site in a manner that ensures all residual soil is removed and that egg deposits from plant pests are not present. The Contractor shall consult with the USDA Plant Protection and Quarantine (USDA - PPQ) jurisdictional office for additional cleaning requirements that may be necessary.

#### 3.1.3 Commercial Borrow

Prior to bringing commercially obtained borrow material onsite, the Contractor shall provide the Contracting Officer with the location of the pit or pits, the names of the owners and operators, and the types and estimated quantities of materials to be obtained from each source.

#### 3.1.4 Soil Disposal Areas on the Project Site

Soil disposal on project site shall be made only to the extent that they meet the requirements for materials as specified in the applicable sections of this specification. Hazardous, toxic, and radiological wastes (HTRW) shall not be disposed of on project site. Disposal operations shall be managed and controlled to prevent erosion of soil or sediment from entering

nearby waters or wetlands. Disposal operations shall be developed and managed in accordance with the grading plan shown on the drawings or as approved by the Contracting Officer.

#### 3.1.5 Disposal of Solid Wastes

Solid waste is rubbish, debris, waste materials, garbage, and other discarded solid materials (excluding clearing debris and hazardous waste as defined in following paragraphs). Solid waste shall be placed in containers and disposed on a regular schedule. All handling and disposal shall be conducted in such a way as to prevent spillage and contamination. The Contractor shall transport all solid waste off the project site and dispose in compliance with Federal, State, and local requirements.

#### 3.1.6 Clearing Debris

Clearing debris is trees, tree stumps, tree trimmings, and shrubs, and leaves, vegetative matter, excavated natural materials (e.g., dirt, sand, and rock), and demolition products (e.g., brick, concrete, glass, and metals).

a. The Contractor shall collect trees, tree stumps, tree trimmings, shrubs, leaves, and other vegetative matter; and shall transport from project site for proper disposal in compliance with Federal, State, and local requirements. The Contractor shall segregate the matter where appropriate for proper disposal. Untreated and unpainted scrap lumber may be disposed of with this debris where appropriate.

b. Excavated natural materials which meet the requirements of the specific specification may be incorporated into the project. All other materials will be transported from the project site for proper disposal in compliance with Federal, State, and local requirements.

c. Demolition products shall be transported from the project site for proper disposal in compliance with Federal, State, and local requirements.

#### 3.1.7 Disposal of Contractor Generated Hazardous Wastes

Hazardous wastes are wastes as defined in 40 CFR 261, and as defined by applicable State and local regulations. Hazardous waste generated by construction activities shall be removed from the work area and be disposed in compliance with Federal, State, and local requirements. The Contractor shall segregate hazardous waste from other materials and wastes, and shall protect it from the weather by placing it in a safe covered location; precautionary measures against accidental spillage such as berming or other appropriate measures shall be taken. Hazardous waste shall be removed from the project site within 60 days. Hazardous waste shall not be dumped onto the ground, into storm sewers or open water courses, or into the sanitary sewer system.

#### 3.1.8 Fuels and Lubricants

Fueling and lubrication of equipment and motor vehicles shall be conducted

in a manner that affords the maximum protection against spills and evaporation. Lubricants and waste oil to be discarded shall be stored in marked corrosion-resistant containers and recycled or disposed in accordance with Federal, State, and local laws and regulations.

### 3.2 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

#### 3.2.1 Known Historic, Archaeological, and Cultural Resources

The Contractor shall install protection for archaeological & cultural resources identified by the Contracting Officer and shall be responsible for their preservation during the contract.

#### 3.2.2 Discovered Historic, Archaeological, and Cultural Resources

If during construction activities, items are observed that may have historic or archaeological value (e.g., Native American human remains or associated objects are discovered), such observations shall be reported immediately to the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in impact to or the destruction of these resources. The Contractor shall prevent his employees from trespassing on, removing, or otherwise disturbing such resources.

### 3.3 PROTECTION OF WATER RESOURCES

The Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters.

#### 3.3.1 Wastewater

Wastewater directly derived from construction activities shall not be discharged before being treated to remove pollutants. Wastewater shall be collected and placed in retention ponds so the suspended materials can settle.

### 3.4 PROTECTION OF AIR RESOURCES

Special management techniques as set out below shall be implemented to control air pollution by the construction activities. These techniques supplement the requirements of Federal, State, and local laws and regulations; and the safety requirements under this Contract. If any of the following techniques conflict with the requirements of Federal, State, or local laws or regulations, or safety requirements under this contract, then those requirements shall be followed in lieu of the following.

#### 3.4.1 Particulates

Airborne particulates, including dust particles, from construction activities and processing and preparation of materials shall be controlled at all times, including weekends, holidays, and hours when work is not in progress. The Contractor shall maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, disposal sites,

borrow areas, and all other work areas free from airborne dust which would cause a hazard or nuisance.

### 3.5 INSPECTION

If the Contracting Officer notifies the Contractor in writing of any observed noncompliance with contract requirements or Federal, State, or local laws, regulations, or permits, the Contractor shall inform the Contracting Officer of proposed corrective action and take such action to correct the noncompliance. If the Contractor fails to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action is taken. No time extensions will be granted or costs or damages allowed to the Contractor for any such suspension.

### 3.6 MAINTENANCE OF POLLUTION CONTROL FACILITIES

The Contractor shall maintain all constructed pollution control facilities and portable pollution control devices for the duration of the Contract or for the length of time construction activities create the particular pollutant.

### 3.7 TRAINING OF CONTRACTOR PERSONNEL

Contractor personnel shall be trained in environmental protection and pollution control. The Contractor shall conduct environmental protection/pollution control meetings for all Contractor personnel. The training and meeting agenda shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, installation and care of facilities (vegetative covers, etc.), and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control. Anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants, shall also be discussed. Other items to be discussed shall include recognition and protection of archaeological sites and artifacts.

### 3.8 QUALITY CONTROL PLAN

#### 3.8.1 General Requirements

The Contractor shall prepare and furnish for review by the Government the Quality Control Plan within 30 calendar days after notice to proceed. Work outside of the features of work included in the accepted plan will not be permitted to begin until acceptance of the amended Quality Control Plan containing the additional features of work to be started.

#### 3.8.2 Contractor Quality Control (CQC) Plan

The Quality Control Plan shall include in its entirety the Contractor Quality Control (CQC) Plan proposed to implement the requirements of Section 00700 CONTRACT CLAUSES 52.246-12 entitled "Inspection of Construction." The CQC Plan requirements are specified in Section 01451 CONTRACTOR QUALITY CONTROL.

### 3.8.3 Chemical Data Quality Control (CDQC)

The Quality Control Plan shall further include and comply with the requirements of Section 01450 CHEMICAL DATA QUALITY CONTROL. The Quality Control Plan shall comply with the provisions of ER 1110-1-263 which integrates USACE guidance on the subject. The Quality Control Plan shall be supplemented by EM 200-1-6 for detail technical guidance. Tables and charts defining Design Analysis (DA) and remedial chemistry shall be according to or consistent with EM 200-1-3.

### 3.9 FINAL REMEDIAL ACTION REPORT

Twelve (12) copies of a Final Remedial Action Report shall be prepared and submitted within 14 calendar days of completing work at the site. The report shall be labeled with the contract number, project name, location, date, name of general contractor, and the Corps of Engineers District contracting for the work. The Final Remedial Action Report shall include the following information as a minimum:

a. A cover letter signed by a Professional Engineer registered in the State of New Jersey certifying that all services involved have been performed in accordance with the terms and conditions of the contract documents.

b. A narrative report including, but not limited to, the following:

(1) Pre-construction site conditions, ground water elevation, surface waters encountered;

(2) Excavation logs;

(3) Field sampling and readings;

(4) Site conditions of any visible contamination.

(5) Quantities of materials removed from each area of contamination;

(6) Quantities of contaminated water removed during dewatering;

(7) Disposal parameters and execution;

(8) Sampling locations and sampling methods;

(9) Collection data and methods of preservation;

(10) Chain-of-custody for each shipment of disposal;

(11) Incorporate a complete copy of the Safety and Health Phase-Out Report as required by this Section; AND

(12) Incorporate a complete copy of the Chemical Data Final Report as required by Section 01450 CHEMICAL DATA QUALITY CONTROL.

c. Copies of all chemical and physical test results.

- d. Copies of all manifests and land disposal documentation.
- e. Copies of all certifications of final disposal signed by the responsible disposal facility official.
- f. Waste profile sheets.
- g. Scaled drawings showing limits of each excavation, limits of contamination, known underground utilities within 50 feet of excavation, sample locations, and sample identification numbers.
- h. Progress Photographs. Color photographs shall be used to document progress of the work. A complete set of photographs shall be included in the Final Remedial Action Report. A minimum of four views of each area of contamination, of construction roads, and all other notable site conditions shall be taken before work begins. After work has been started, a minimum of four views of activities at each work location shall be photographically recorded weekly. Photographs shall be a minimum of 3 x 5 inches and shall include:
  - (1) Topsoil removal, handling, and sampling.
  - (2) Earth removal, handling and temporary storage locations.
  - (3) Unanticipated events such as discovery of contaminated material.
  - (4) Contaminated material storage.
  - (5) Personal protection equipment.
  - (6) Flood protection of construction.
  - (7) Post-construction photographs. After completion of work at each site, the Contractor shall take a minimum of four views of each excavation site.

Photographs shall be mounted back-to-back in double face plastic sleeves punched to fit standard three ring binders. Each print shall have an information box attached. The box shall be typewritten and arranged as follows:

Project Name: Direction of View:

Location: Date/Time:

Photograph No.:

Description of View:

-- End of Section --

## SECTION 01356

STORM WATER POLLUTION PREVENTION MEASURES  
(EROSION AND SEDIMENTATION CONTROL)

08/96

Item No. 3a - Erosion and Sedimentation Control  
Item No. 12 - Crushed Stone  
Item No. 15 - Geotextile

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4439	(1997) Standard Terminology for Geosynthetics
ASTM D 4491	(1996) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991; R 1996) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991; R 1996)) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1995) Determining Apparent Opening Size of a Geotextile
ASTM D 4873	(1995) Identification, Storage, and Handling of Geosynthetic Rolls

## NEW JERSEY DEPARTMENT OF TRANSPORTATION (NJDOT)

## Standard Specification for Road and Bridge Construction

## 1.2 GENERAL

The Contractor shall implement the storm water pollution prevention measures specified in this section in a manner which will meet the requirements of Section 01354 ENVIRONMENTAL PROTECTION, and the requirements of the National Pollution Discharge Elimination System (NPDES) permit attached to that Section.



### 1.3 SUBMITTALS

Government approval is required for all submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-13 Certificates

Mill Certificate or Affidavit; G AE.

### 1.4 EROSION AND SEDIMENT CONTROLS

The controls and measures required by the Contractor are described below.

#### 1.4.1 Stabilization Practices

The stabilization practices to be implemented shall include temporary seeding, mulching, protection of trees, preservation of mature vegetation, and protection of flora and fauna. On his daily CQC Report, the Contractor shall record the dates when the major grading activities occur, (e.g., clearing and grubbing, excavation, levee construction and grading); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Except as provided in paragraphs UNSUITABLE CONDITIONS and NO ACTIVITY FOR LESS THAN 21 DAYS, stabilization practices shall be initiated as soon as practicable, but no later than 14 days, in any portion of the site where construction activities have temporarily or permanently ceased.

##### 1.4.1.1 Unsuitable Conditions

Where the initiation of stabilization measures by the fourteenth day after construction activity temporarily or permanently ceases is precluded by unsuitable conditions caused by the weather, stabilization practices shall be initiated as soon as practicable there after when weather conditions become suitable.

##### 1.4.1.2 No Activity for Less Than 21 Days

Where construction activity will resume on a portion of the site within 21 days from when activities ceased (e.g., the total time period that construction activity is temporarily ceased is less than 21 days), then stabilization practices do not have to be initiated on that portion of the site by the fourteenth day after construction activity temporarily ceased.

#### 1.4.2 Structural Practices

Structural practices shall be implemented to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Structural practices shall be implemented in a timely manner during the construction process to minimize erosion and sediment runoff. Structural practices shall include the following devices. Location and details of installation and construction are shown on the drawings.

#### 1.4.2.1 Silt Fences

The Contractor shall provide silt fences as a temporary structural practice to minimize erosion and sediment runoff. Silt fences shall be properly installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g. clearing and grubbing, excavation, levee construction, and grading). Silt fences shall be installed in the locations indicated on the drawings. Final removal of silt fence barriers shall be upon approval by the Contracting Officer.

#### 1.4.2.2 Straw Bales

The Contractor shall provide bales of straw as a temporary structural practice to minimize erosion and sediment runoff. Bales shall be properly placed to effectively retain sediment immediately after completing each phase of work (e.g., clearing and grubbing, excavation, embankment, and grading) in each independent runoff area (e.g., after clearing and grubbing in an area between a ridge and drain, bales shall be placed as work progresses, bales shall be removed/replaced/relocated as needed for work to progress in the drainage area). Areas where straw bales are to be used are shown on the drawings. Final removal of straw bale barriers shall be upon approval by the Contracting Officer. Rows of bales of straw shall be installed as indicated on the drawings:

#### 1.4.2.3 Stabilized Construction Driveways

The contractor shall construct stabilized construction driveways to reduce the tracking or flowing of sediment onto Public Right-Of-Ways. Stabilized construction driveways shall be installed at the location indicated on the drawings. Final removal of stabilized construction driveways shall be upon approval by the Contracting Officer.

#### 1.4.2.4 Storm Sewer Inlet Protection

The contractor shall install storm sewer inlet protection to intercept and return sediment, thus preventing the entrance of sediment into the storm sewer system. Inlet protection shall be installed at locations indicated on the drawings. Final removal of storm sewer inlet protection shall be upon the approval of the Contracting Officer.

### PART 2 PRODUCTS

#### 2.1 COMPONENTS FOR SILT FENCES

##### 2.1.1 Filter Fabric

The geotextile shall comply with the requirements of ASTM D 4439, and shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. The filament shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, or amide, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistance to

deterioration due to ultraviolet and heat exposure. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of ( 0 to 120 degrees F). The filter fabric shall meet the following requirements:

FILTER FABRIC FOR SILT SCREEN FENCE

PHYSICAL PROPERTY	TEST PROCEDURE	STRENGTH REQUIREMENT
Grab Tensile	ASTM D 4632	100 lbs. min.
Elongation (%)		30 % max.
Trapezoid Tear	ASTM D 4533	55 lbs. min.
Permittivity	ASTM D 4491	0.2 sec-1
AOS (U.S. Std Sieve)	ASTM D 4751	20-100

2.1.2 Silt Fence Stakes and Posts

The Contractor may use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when oak is used and 4 inches by 4 inches when pine is used, and shall have a minimum length of 5 feet. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 5 feet.

2.1.3 Mill Certificate or Affidavit

A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above. The mill certificate or affidavit shall specify the actual Minimum Average Roll Values and shall identify the fabric supplied by roll identification numbers. The Contractor shall submit a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the filter fabric.

2.1.4 Identification Storage and Handling

Filter fabric shall be identified, stored and handled in accordance with ASTM D 4873.

2.2 COMPONENTS FOR STRAW BALES

The straw in the bales shall be stalks from oats, wheat, rye, barley, rice, or from grasses such as byhalia, bermuda, etc., furnished in air dry condition. The bales shall have a standard cross section of 14 inches by 18 inches. All bales shall be either wire-bound or string-tied. The Contractor may use either wooden stakes or steel posts to secure the straw bales to the ground. Oak wooden stakes utilized for this purpose, shall have a minimum dimensions of 2 inches x 2 inches in cross section and shall

have a minimum length of 3 feet. Steel posts (standard "U" or "T" section) utilized for securing straw bales, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 3 feet.

### 2.3 COMPONENTS FOR STABILIZED CONSTRUCTION DRIVEWAYS

Crushed stone shall meet the requirements of ASTM C-33, size number 2 or 3, and geotextile fabric shall be Mirafi 600X or an approved equal.

### 2.4 COMPONENTS FOR STORM SEWER INLET PROTECTION

Crushed stone shall comply with the NJDOT standard specifications for coarse aggregate number 8. Geotextile fabric shall be Mirafi 100X or an approved equal. Welded wire fabric shall meet the requirements of Section 03201 "STEEL BARS AND WELDED WIRE FABRIC FOR CONCRETE REINFORCEMENT FOR CIVIL WORKS".

## PART 3 EXECUTION

### 3.1 INSTALLATION OF SILT FENCES

Silt fences shall extend a minimum of 24 inches above the ground surface and shall not exceed 34 inches above the ground surface. Filter fabric shall be from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter fabric shall be spliced together at a support post, with a minimum 6 inch overlap, and securely sealed. A trench shall be excavated approximately 6 inches wide and 6 inches deep on the uphill side of the location of the silt fence. The 6-inch by 6-inch trench shall be backfilled and the soil compacted over the filter fabric. Silt fences shall be removed upon approval by the Contracting Officer.

### 3.2 INSTALLATION OF STRAW BALES

Straw bales shall be placed in a single row, lengthwise on the contour (unless shown otherwise on the drawings), with ends of adjacent bales tightly abutting one another. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales in order to prevent deterioration of the bindings. The barrier shall be entrenched and backfilled unless noted otherwise. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked (gaps filled by wedging with straw), the excavated soil shall be backfilled against the barrier. Stakes shall not be required for paved surfaces at locations shown on the drawings. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier. Loose straw shall be scattered over the area immediately uphill from a straw bale barrier to increase barrier efficiency. Each bale shall be securely anchored by at least two stakes driven through the bale. The first stake or steel post in each bale shall be driven toward the previously laid bale to force the bales together. Stakes or steel pickets shall be driven a minimum 18 inches deep into the ground to securely anchor the bales.

### 3.3 INSTALLATION OF STABILIZED CONSTRUCTION DRIVEWAYS AND STORM SEWER INLET PROTECTION

Stabilized construction driveways and storm inlet sewer protection shall be installed at the location shown and complying with the details shown on the drawings.

### 3.3 MAINTENANCE

The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. The following procedures shall be followed to maintain the protective measures.

#### 3.3.1 Silt Fence Maintenance

Silt fences shall be inspected in accordance with paragraph INSPECTIONS. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be seeded in accordance with Section 02921 SEEDING.

#### 3.3.2 Straw Bale Maintenance

Straw bale barriers shall be inspected in accordance with paragraph INSPECTIONS. Close attention shall be paid to the repair of damaged bales, end runs and undercutting beneath bales. Necessary repairs to barriers or replacement of bales shall be accomplished promptly. Sediment deposits shall be removed when deposits reach one-half of the height of the barrier.

Bale rows used to retain sediment shall be turned uphill at each end of each row. When a straw bale barrier is no longer required, it shall be removed. The immediate area occupied by the bales and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be seeded in accordance with Section 02921 SEEDING.

#### 3.3.3 Stabilized Construction Driveways Maintenance

Stabilized Construction Driveways shall be inspected in accordance with paragraph INSPECTIONS. Any required repairs shall be made promptly. The stabilized construction driveway shall be maintained in a condition which will prevent tracking or flowing of sediment onto the public Right of Way pavement. This requires periodic top dressing with additional stone or additional length as conditions demand and repair and/or clean out of any measure used to trap sediment or as maybe required by the Contracting

Officer, as conditions demand. All sediment spilled, dropped, washed, or tracked onto the public Right of Way/pavement must be removed immediately. Where tracking of soil onto roadways is a continual occurrence, the contractor is required to broom sweep the roadway at two-hour intervals minimum and prior to leaving the construction site at the day end. When the stabilized construction driveway is no longer required as determined by the Contracting Officer, it shall be removed. The area shall be restored to its previous condition or as shown on the plans.

#### 3.4.4 Storm Sewer Inlet Protection Maintenance

Storm sewer inlet protection shall be inspected in accordance with paragraph INSPECTIONS. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged geotextile fabric. Should the fabric decompose or become ineffective, the fabric shall be replaced promptly. Sediment deposits shall be removed after each storm. When an inlet protection is no longer required as determined by the Contracting Officer, it shall be removed.

### 3.4 INSPECTIONS

#### 3.4.1 General

The Contractor shall inspect disturbed areas of the construction site, areas used for storage of materials that are exposed to precipitation that have not been finally stabilized, stabilization practices, structural practices, other controls, and area where vehicles exit the site at least once every seven (7) calendar days and within 24 hours of the end of any storm that produces 0.5 inches or more rainfall at the site. Where sites have been finally stabilized, such inspection shall be conducted at least once every month.

#### 3.4.2 Inspections Details

Disturbed areas and areas used for material storage that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the Storm Water Pollution Prevention Plan shall be observed to ensure that they are operating correctly. Discharge locations or points shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles exit the site shall be inspected for evidence of off site sediment tracking.

#### 3.4.3 Inspection Reports

For each inspection conducted, the Contractor shall prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the Storm Water Pollution Prevention Plan, maintenance performed, and actions taken. The report shall be furnished to the Contracting Officer within 24 hours of the inspection as a part of the Contractor's daily CQC REPORT. A copy of the inspection report shall be maintained on the job site.

-- End of Section --

## SECTION 01420

SAFETY  
nyd 08/99

1.0 **SAFETY:** The contractor shall comply with all applicable Federal, State, and local safety and occupational health laws and regulations. Applicable provisions of the Corps of Engineers manual entitled Safety and Health Requirements Manual EM 385-1-1, dated 3 September 1996 will be applied to all work under this contract.

1.1 **U.S. ARMY CORPS OF ENGINEERS SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1:** This paragraph applies to contracts and purchase orders that require the contractor to comply with EM 385-1-1 (e.g., contracts that include the Accident Prevention clause at FAR 52.236-13 and/or other safety provisions). EM 385-1-1 and its changes are available at <http://www.hq.usace.army.mil> (at the HQ homepage, select Safety and Occupational Health and then select Changes to EM). The Contractor shall be responsible for complying with the current edition and all changes posted on the web as set forth in this solicitation.

2.0 **ACCIDENT PREVENTION PROGRAM:** Within fifteen (15) calendar days after receipt of Notice to Proceed, and at least ten (10) calendar days prior to the Pre-construction Safety Conference, four (4) copies of the Accident Prevention Plan shall be submitted for review and acceptance by the Contracting Officer or the Contracting Officers Representative (COR). The accident prevention program shall be prepared in the format outlined in Appendix A of EM 385-1-1, "Minimum Basic Requirements for Accident Prevention Plan".

3.0 **HAZARD ANALYSIS:** Prior to beginning each major phase of work, an Activity Hazard Analysis shall be prepared by the Contractor performing that work, and submitted for review and acceptance. The format shall be in accordance with EM 385-1-1, figure 1-1. A major phase of work is defined as an operation involving a type of work presenting hazards not experienced in previous operations or where a new contractor or work crew is to perform. (See Contractor Quality Control specification for further guidance regarding coordination of "Activities" and "Principal Steps" indicated in the Activity Hazard Analysis with Contractor Quality Control activities). The analysis shall define the activities to be performed and identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the activity hazard analysis has been accepted and a preparatory meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activities, including the government on-site representative(s). The activity hazard analyses shall be continuously reviewed and when appropriate modified to address changing site conditions or operations, with the concurrence of the site safety representative, the site superintendent, and the Contracting Officer. Activity hazard analyses shall be attached to and become part of the accident prevention plan. It may



also be developed prior to each phase of work undertaken in the contract. (Sample copies of the ACTIVITY HAZARD ANALYSIS form are provided at the end of this section).

3.1 Hazard analysis shall be used to identify and evaluate all substances, agents, or environments that present hazards and recommend control measures. Engineering and administrative controls shall be used to control hazards; in cases where engineering or administrative controls are not feasible, personal protective equipment may be used.

3.2 Information contained in MSDS (Material Safety Data Sheets) shall be incorporated in the hazard analysis for the activities in which hazardous or toxic materials will be used, or generated (e.g. fiberglass, crystalline silica, metal dust or fume, etc.).

4.0 **SITE SAFETY OFFICER :** The contractor shall identify an individual directly employed by the contractor as Site Safety Officer responsible to the Contractor to implement and continually enforce the Accident Prevention Plan. The site safety officer shall not be the same individual as the Quality Control System Manager if the CQC System Manager is required to have no duties other than Quality Control. The site safety officer shall have the authority to suspend operational activities if the health and safety of personnel are endangered, and to suspend an individual from operational activities for infractions of the Accident Prevention Plan.

4.1. Qualifications: The name, qualifications (training and experience) of the designated Site Safety Officer shall be included in the Accident Prevention Plan. The Site safety officer shall have the following qualifications:

- a. A minimum of 5 years construction experience with at least 2 years experience in implementing safety programs at construction work sites for projects of comparable scope and complexity.

- b. Documented experience in construction techniques and construction safety procedures.

- c. Working knowledge of Federal and state occupational health and safety regulations.

- d. Specific training in excavation safety, fall protection, and confined space.

- e. CPR/First Aid certification (current)

- f. Familiarity with and ability to use and implement the Corps of Engineers Safety Manual EM 385-1-1.

4.2. Other Requirements: Other sections of the contract documents may also require separate specially qualified individuals in such areas as chemical data acquisition, sampling and analysis, medical monitoring, industrial hygiene, quality control, etc.

5.0 **SITE INSPECTIONS:** The site safety officer shall perform daily

inspections of the job sites and the work in progress to ensure compliance with EM 385-1-1 and to determine the effectiveness of the accident prevention plan. Daily inspection logs shall be used to document inspections noting safety and health deficiencies, deficiencies in the effectiveness of the accident prevention plan, and corrective actions including timetable and responsibilities. The daily inspection logs will be attached to and submitted with the Daily Quality Control Reports or may be incorporated in the daily QQC report. Each entry shall include date, work area checked, employees present in work area, protective equipment and work equipment in use, special safety and health issues and notes, and signature of the preparer.

**6.0 HIGHLIGHTED PROVISIONS:** In addition to those items contained in EM 385-1-1, Appendix A, include the following items in the accident prevention plan:

**6.1 Hard Hat Area.** A statement that the jobsite is classified a "hard hat" area from start to finish.

**6.2 Sanitation and Medical Requirements.** Estimate the greatest number of employees, supervisors, etc., to be working at peak construction period, including subcontractor personnel. Include sanitation requirements and medical facilities identified for the job site. If a medical facility or physician is not accessible within five minutes of an injury to a group of two or more employees for the treatment of injuries, identify at least two or more employees on each shift who are qualified to administer first aid and CPR.

**6.3 Equipment Inspection.** The type of inspection program on cranes, trucks, and other types of construction equipment the Contractor plans to implement. Who will be responsible for the inspection and how the Contractor will control equipment of sub-contractors and equipment bought to the site by rental companies. Types of records to be kept.

**6.3.1** Copies of records of all equipment inspections will be kept at the job site for review by the designated authority.

**6.4 Crane & Derrick Operators:** Written proof of qualification for all crane and derrick operators in accordance with EM 385-1-1, 16.C.04. Qualification shall be by written (or oral) examination and practical operating examination unless the operator is licensed by a state or city licensing agency for the particular type of crane or derrick. Proof of qualification shall be provided by the qualifying source.

**6.5 Critical Lifts:** are defined as non-routine crane lifts requiring detailed planning and additional or unusual safety precautions. Critical lifts include lifts made when the load weight is 75% of the rated capacity of the crane; lifts which require the load will be lifted, swung, or placed out of the operator's view; lifts made with more than one crane; lifts involving non-routine or technically difficult rigging arrangement; hoisting personnel with a crane or derrick; or any lift which the lift operator believes should be considered critical.

**6.6 Critical Lift Plan:** Before making a critical lift, a critical lift

plan shall be prepared by the crane operator, lift supervisor, and rigger. The New York District Safety Office Critical Lift Plan shall be completed by the contractor, signed by an officer of the company, and submitted to the Contracting Officer's Representative (COR) for acceptance prior to the lift.

6.7 Haul Road Plan: For every access and haul road, a plan shall be submitted to the Contracting Officer's Representative (COR). The plan shall address the following:

- a. equipment usage, traffic density, and hours of operation;
- b. road layout and windths, horizontal and vertical curve data, and sight distances;
- c. sign and signal person requirements, road markings, and traffic control devices;
- d. drainage controls;
- e. points of contact between vehicles and the public; and safety conrols at these points of contact; and
- f. maintenance requirements, including roadway hardness and smoothness and dust control.

7.0 **ACCIDENT REPORTS:** The contractor shall immediately report all accidents by telephone to the COR.

7.1 The Contractor will provide an initial written report of the accident to the COR within 24 hours. The Contractor shall complete and submit ENG Form 3394 for all accidents involving lost work time, medical treatment, and/or property damage in excess of \$2000.00 within 48 hours of the accident. The report shall accurately represent the circumstances of the accident, cause of the accident, extent of medical treatment, extent of injuries and steps to prevent occurrence of similar accidents. The hazard analysis covering the work activity being undertaken during the accident shall be attached to the report.

7.2 Daily records of all first aid treatment not otherwise reportable shall be maintained at the job site and furnished to the designated authority upon request. Records shall also be maintained of all exposure and accident experience incidental to the work (OSHA Form 200 or equivalent as prescribed by 29 CFR 1904).

8.0 **MONTHLY EXPOSURE REPORTS:** The Contractor shall submit to the COR no later than the 1st day of each month, a compilation of manhours worked each month by the prime contractor and each subcontractor. In addition ,the contractor shall report the number of accidents, severity, class of accidents, and lost time work days for each month.

9.0 **CLEAN-UP:** The Contractor's Accident Prevention Plan shall identify the individual's responsible for cleanup and shall establish a regular housekeeping procedure and schedule. If the COR determines that cleanup is not being performed satisfactorily, the Contractor shall establish a work crew to perform the continuous cleanup required by the contract clause titled: CLEANING UP: The number of individuals appointed to the cleanup work crew shall be increased as required in order to render adequate cleanup.

10.0 **FOCUS AREAS:** To supplement and emphasize the requirements of EM 385-1-1, the following is provided and shall be met as applicable.

10.1 Electrical Work: Electrical work shall not be performed on or near energized lines or equipment unless specified in the plans and specifications and approved by the COR. Plan and layout of proposed temporary power to the construction site shall be submitted and approved by the COR before work will be permitted.

10.1.1 Upon request by the Contractor, arrangements will be made for de-energizing lines and equipment so that work may be performed. All outages shall be requested through the COR a minimum of 14 days, unless otherwise specified, prior to the beginning of the specified outages. Dates and duration will be specified.

10.2 If approved by the COR, the following work may be performed with the lines energized using certified hot line equipment on lines above 600 volts, when the following conditions have been met:

- a. work below the conductors no closer than the clearance required in EM 385-1-1 from the energized conductors.
- b. setting and connection of new pre-trimmed poles in energized lines which do not replace an existing pole.
- c. setting and removing transformers or other equipment on poles.
- d. installation or removal of hot line connectors, jumpers, dead-end insulators for temporary isolation, etc., which are accomplished with hot line equipment from an insulated bucket truck.

10.3 Energized Line Work Plan: The Contractor shall submit a plan, in writing, describing his/her method of operation and the equipment to be used on energized lines. Proper certification from an approved source of the safe condition of all tools and equipment will be provided with the plan. The work will be planned and scheduled so that proper supervision is maintained. Emergency procedures, including communication, for disconnecting power in the event of an accident will be outlined in the plan. The Contractor will review his/her plan with the COR prior to being granted permission to perform the work.

10.4. No work on lines greater than 600 volts will be performed from the pole or without the use of an insulated bucket truck.

10.5 No work will be done on overbuilt lines while underbuilt lines are energized, except for temporary isolation and switching.

10.6 Electrical Tools and Cords: Hand held electrical tools shall be used only on circuits protected by ground fault circuit interrupters for protection of personnel. All general use extension cords shall be hard usage or extra hard usage as specified in Table 11-1 of EM 385-1-1. Damaged or repaired cords shall not be permitted.

10.7 Temporary Power: Temporary electrical distribution systems and devices shall be checked and found acceptable for polarity, ground continuity, and ground resistance before initial use and after modification. GFI outlets shall be installed and tested with a GFI circuit tester (tripping device) prior to use. Portable and vehicle mounted generators shall be inspected for compliance with EM 385-1-1 and NFPA 70. All electrical equipment located outdoors or in wet locations shall be enclosed in weatherproof enclosures in accordance with EM 385-1-1. Records of all tests and inspections will be kept by the contractor and made available on site for review by the designated authority. Submit sketch of proposed temporary power for acceptance.

10.8 Rollover Protective Structures (ROPS): Seat belts and ROPS shall be installed on all construction equipment as required by paragraph 16.B.12 of EM 385-1-1. The operating authority will furnish proof from the manufacturer or licensed engineer that ROPS meets the applicable SAE standards cited in EM 385-1-1, pg. 257.

10.9 Radiation Permits or Authorizations: Contractors contemplating the use of a licensed or DOD regulated radiological device or radioactive material on a DOD installation will secure appropriate permit or authorization from the Department of Army or Department of the Air Force, as applicable. A 45-day lead-time should be programmed for obtaining the necessary authorization or permit. When requested, the COR will assist the Contractor in obtaining the required permit or authorization.

10.9.1 The Contractor shall develop and implement a radiation safety program to comply with EM 385-1-1, Section 06.E. Provisions for leak tests, authorized personnel, transport certificates, etc. will be addressed in the radiation safety program.

10.10 Elevating Work Platforms: All elevating work platforms shall be designed, constructed, maintained, used, and operated in accordance with ANSI A92.3, ANSI A92.6, ANSI A92.5 and EM 385-1-1, Sections 22.J and 16.A.

10.10.1 Only personnel trained in the use of elevating work platforms shall be authorized to use them. A list of authorized users will be maintained by the contractor at the job site. The list will be updated to remain current and made available for review on site by the designated authority. Personnel safety belts must be worn.

10.11 Fall Protection: Fall protection in the form of standard guardrails, nets, or personal fall arrest systems will be provided for all work conducted over 6 feet in height. The contractor will submit his/her proposed method of fall protection to the COR as part of the Job Hazard Analysis for acceptance. If the contractor deems that conventional fall protection as described above is not feasible, or creates a greater hazard, the Contractor will prepare a written fall protection plan in accordance with OSHA 29 CFR 1926.502(k). The plan will demonstrate the reasons that conventional fall protection is unfeasible or constitutes a greater hazard and will provide alternative safety measures for review and acceptance by the COR.

10.12 Excavations: All open excavations made in the earth's surface four

(4) foot or greater will be under the supervision of a competent person trained in, and knowledgeable about, soils analysis, the use of protective systems, and the requirements of OSHA 29 CFR 1926, Subpart P and EM 385-1-1, Section 25. The competent person shall be designated in writing by the Contractor and a resume of their training and experience submitted to the COR for acceptance.

10.12.1 Excavations hazards and methods for their control will be specified in the job hazard analysis.

10.12.2 Sloping and benching: The design of sloping and benching shall be selected from and in accordance with written tabulated data, such as charts and tables. At least one copy of the tabulated data will be maintained at the job site.

10.12.3 Support Systems: shall be in accordance with one of the systems outlined in a through c below:

a. Designs drawn from manufacturer's specifications and in accordance with all specifications, limitations, and recommendations issued or made by the manufacturer. A copy of the manufacture's specifications, recommendations, and limitations will be in written form and maintained at the job site.

b. Designs selected from and in accordance with tabulated data (such as tables and charts). At least one copy of the design shall be maintained at the job site during excavation.

c. Designed by a registered engineer. At least one copy of the design shall be maintained at the job site during excavation.

10.12.4 Excavations Greater than 20 Feet in Height: Sloping and benching or support systems shall be designed by a registered professional engineer. Designs shall be in writing and at least one copy of the design shall be maintained at the job site during excavation. The contractor will ensure that the registered professional engineer is working within a discipline applicable to the excavation work; i.e. it would be inappropriate for an electrical engineer to approve shoring designed for an excavation.

10.13 Confined Space: The Contractor shall develop detailed written standard operating procedures for confined spaces in accordance with 29 CFR 1910.146 and EM 385-1-1, and as further described in this paragraph:

a. The contractor shall supply certificate of calibration for all testing and monitoring equipment. The certificate of calibration shall include: type of equipment, model number, date of calibration, firm conducting calibration, and signature of individual certifying calibration.

b. The procedures shall include methods of inspection of personal protective equipment prior to use.

c. The procedures shall include work practices and other engineering controls to reduce airborne hazards and other potential hazards (i.e. engulfment, hazardous energy, etc.) to a minimum.

10.14 **Control of Hazardous Energy:** Before any servicing or maintenance on a system where the unexpected energizing, start-up, or release of kinetic or stored could occur and cause injury or damage, the system shall be isolated in accordance with EM 385-1-1, Section 12 "Control of Hazardous Energy (Lockout/tagout)".

10.14.1 **Hazardous Energy Control Plan:** Contractor's planning the use of hazardous energy control procedures shall submit their hazardous energy control plan to the Contracting Officer Representative (COR) for acceptance. Implementation of hazardous energy control procedures shall not be initiated until the hazardous energy control plan has been accepted by the COR.

11.0 **LANGUAGE:** For each group that has employees that do not speak English, the Contractor will provide a bilingual foreman that is fluent in the language of the workers. The contractor will implement the requirements of EM 385-1-1, 01.B through these foremen.

12.0 **CONTRACTOR SAFETY MEETINGS AND DOCUMENTATION:** Contractor shall conduct and document safety meetings among its personnel as required by EM 385-1-1 and as indicated herein. Monthly meetings shall be held among all supervisors, and weekly meetings shall be conducted by supervisors or foreman for all workers. The agenda of the meeting shall include specific safety items pertinent to work being performed. Documentation shall include a summary of items discussed as well as other items required by the EM 385-1-1. Documentation shall be submitted to the Government monthly.

13.0 **COORDINATION WITH OTHER SPECIFICATION SECTIONS:** The requirements of this section are meant to supplement requirements of other sections. In cases of discrepancies the most stringent requirements shall apply. Other safety-related requirements can be found in the following specification section:

- a. Specification Section 00800, Special Contract Requirements

14.0 **CONTRACTOR PERFORMANCE APPRAISAL:** The occurrence of accidents and near misses due to negligence are strong indications that there has been insufficient emphasis on effective implementation and/or commitment to the accident prevention program. Should it become obvious that only lip service is being given to this program, an interim unsatisfactory performance appraisal rating will be issued. If safety continues to be unsatisfactory or marginal, the unsatisfactory rating will become final. The contractor should be aware that this appraisal will be stored in a national computer database which can be accessed by a multitude of agencies or municipalities desiring information on prospective contractors. An unsatisfactory rating in this database may affect the contractor's ability to obtain future Government work.

-- End of Section --

## SECTION 01450

## CHEMICAL DATA QUALITY CONTROL

**10/97**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 261 Identification and Listing of Hazardous Waste

49 CFR 172 Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

49 CFR 178 Specifications for Packagings

## U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 200-1-1 (1994) Validation of Analytical Chemistry Laboratories

EM 200-1-3 (1994) Requirements for the Preparation of Sampling and Analysis Plans Ch 1

EM 200-1-6 (1997) Chemical Quality Assurance

ER 1110-1-263 (1996) Data Quality Management for Hazardous, Toxic, Radioactive Waste Remedial Activities

## U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 540/R 94-012 (1994) Contract Laboratory Program National Functional Guidelines for Inorganic Data Review

EPA 540/R 94-013 (1994) Contract Laboratory Program National Functional Guidelines for Organic Data Review

EPA SW-846 (Rev O; updates I, II, IIA, IIB, and III) Test Methods for Evaluating Solid Waste



(Vol IA, IB, IC, and II)

U.S. ARMY ENVIRONMENTAL HYGIENE AGENCY (USAEHA)

USAEHA Protocol (1993) Sampling Protocol Building  
Demolition Debris and Buildings Painted  
with Lead-Based Paint

1.2 ACRONYMS

CDFR - Chemical Data Final Report  
CDQC - Chemical Data Quality Control  
CQAR - Chemical Quality Assurance Report  
CQC - Contractor Quality Control  
DA - Design Analysis  
DQO - Data Quality Objectives  
FSP - Field Sampling Plan  
QA - Quality Assurance  
QAPP - Quality Assurance Project Plan  
SAP - Sampling and Analysis Plan

1.3 CHEMISTRY REQUIREMENTS

Chemical Data Quality Control (CDQC) shall comply with and is defined in ER 1110-1-263, which integrates USACE guidance on the subject. The CDQC shall be supplemented by EM 200-1-6 for detail technical guidance. Tables and charts defining Design Analysis (DA), and remedial chemistry shall be according to or consistent with EM 200-1-3.

Chemical analyses shall include but not be limited to the following:

Acetones, Aluminum, Antimony, Arsenic and compounds, Beryllium and compounds, Benzenes and compounds, Cadmium, Carbon Disulfide, Chlorines and compounds, Chromium and compounds, Copper, Fluorines and compounds, Iron, Lead, Mercury, Naphthas and compounds, Pyridines and compounds, Tetra compounds, Toluenes and compounds, Vanadium, Zinc compounds, and Total Recoverable Petroleum Hydrocarbon.

1.3.1 Data Quality Objectives (DQO)

Sample acquisition, chemical analysis and chemical parameter measurements shall be performed so that the resulting data meet and support data use requirements. The chemical data shall be acquired, documented, verified and reported to ensure that the specified precision, accuracy, representativeness, comparability, completeness and sensitivity requirements are achieved.

1.3.2 Sampling, Analysis and Measurement

1.3.2.1 Soil/Sediment and Ground/Surface Water Samples

Soil and sediment along with ground and surface water samples shall be collected at 10 locations as selected by the Contracting Officer. The samples shall be shipped to a primary laboratory.

#### 1.3.2.2 Manifesting Samples

Material shipping manifesting shall be in accordance with 40 CFR 261, 40 CFR 262, 40 CFR 268, 49 CFR 172, and 49 CFR 178.

#### 1.3.2.3 Real-Time Instrumental Measurement Samples

Real-time instrumental measurements shall be analyzed onsite for chemical parameters as approved by the Contracting Officer.

#### 1.3.2.4 Perimeter Air Monitoring Samples

Perimeter air monitoring samples shall be analyzed as approved by the Contracting Officer.

#### 1.3.2.5 Field Screening

Field screening shall include flame ionization detection, colorimetric, and field gas chromatography.

### 1.4 QUALITY ASSURANCE ELEMENTS

The Contractor shall be responsible for the following QA elements necessary to monitor and ensure the quality of chemical data produced.

#### 1.4.1 Laboratory Validation Requirements

The Contractor shall propose the minimum number of laboratories that can attain or have attained U.S. Army Corps of Engineers (USACE) validation in accordance with EM 200-1-1 and consistent with contract required chemical data quality. The Contractor may propose laboratories that shall subsequently be validated by the USACE, or select currently validated USACE laboratories. The Contractor shall identify all proposed project laboratories in the sampling and analysis plan (SAP). If a proposed analytical laboratory cannot meet specified analytical requirements or achieve the required validation, the Contractor shall select from currently approved USACE validated laboratories. If not currently validated, the Contractor is advised that USACE laboratory validation process requires a nominal 120 day process. The Contractor shall not be permitted any delay or monetary relief for validations.

#### 1.4.2 Quality Assurance Sample Collection and Analysis

The Contractor shall be responsible for collection and transportation of QA samples to the QA laboratory. Samples for all analyses (except volatiles) shall be taken as splits of homogenized samples. Samples for volatiles shall be collected as discrete triplicates. Samples shall be collected at a rate of 10% percent per analysis per sampling event.

- a. The Contractor shall submit the QA PLAN to the QA laboratory. The QA PLAN shall include a list of laboratory-related DQO. The DQO shall include, but shall not be limited to, identification of extraction and analysis method numbers, a list of analytes with

required limits, estimated number of tests, approximate sampling dates, and requested completion date for QA testing. The Contractor shall notify the Contracting Officer (CO) and the QA laboratory immediately of any changes.

- b. The Contractor shall provide all labor and field supplies, including sample containers and shipping coolers, for collecting and shipping samples for QA testing. The Contractor shall, in the presence of the CO, properly collect, label, and package the QA samples, fill out all chain-of-custody forms, and ship the samples by one-day delivery service to the designated QA laboratory for analysis. The Contractor shall notify the laboratory when all sampling is completed and shall clearly mark the chain-of-custody form accompanying the final shipment "FINAL" in 1 inch high lettering.
- c. The Contractor shall allow 60 calendar days for laboratory analysis of QA samples, data review, and submission of the Government chemical quality assurance report. The elapsed time shall begin when the Contractor's last sample arrives at the QA laboratory, provided that the Contractor's completed chemistry data package is received within 30 calendar days thereafter. Otherwise, the Contractor shall allow 30 calendar days from the date the completed chemistry data package is received at the QA laboratory. The Contractor may, as an option, continue activities based on initial sampling and QC results, before receipt of QA test results. Where QA results are unacceptable due to Contractor negligence (e.g. improper sample collection and/or handling by the Contractor), or where QA sample results conflict with the Contractor's primary sample results, further sampling and testing shall be performed as directed by the CO. All costs for such additional sampling and testing due to Contractor negligence, including both QC and QA testing and analysis, and for any required remedial actions in the work, shall be borne by the Contractor. USACE acceptance of final disposition of any excavated soil shall not occur until the Contractor's sampling and QC results have been confirmed by QA results. This includes all final stockpiling, wasting, backfilling, and related construction. No payment will be made for laboratory sampling and testing before receipt and acceptance by the Government of the QA samples and the completed Chemical Data Final Report (CDFR), properly formulated according to these specifications.

#### 1.4.3 Single or Double Blind Performance Evaluation Samples

The Contractor shall submit certified soil, water, and air Performance Evaluation (PE) samples. The PE samples shall contain the site-specific contaminants of concern. The analytes shall be contained in the PE samples at the site-specific action levels for each target analyte. Throughout the duration of the project 10% (which is rounded up to complete samples) of the samples per analysis type shall be submitted for analysis. At least 10% of the samples for the first week shall be submitted for analysis so that the Contractor can assess the quality of the laboratory data. If the laboratory does not meet the certified PE sample acceptance limits, project

sample analysis shall be terminated until corrective actions have been implemented. The Contractor shall supply the PE sample results and the vendor's acceptance limit documentation to the CO within one work day following verbal and/or written reporting of the results by the laboratory.

#### 1.4.4 Review of Primary Laboratory Data

The Contractor shall be responsible for the independent data review of the entire primary data set.

#### 1.4.5 Validation of Data

The Contractor shall be responsible for validating the data in accordance with EPA 540/R 94-012 and EPA 540/R 94-013. The data validation strategy shall be established at the beginning of the project to be consistent with project DQO.

### 1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-03 Product Data

Sampling and Analysis Plan; G AE.

The SAP including the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP), no later than 30 days after receipt of notice to proceed.

#### SD-06 Test Reports

Quality Assurance (QA) PLAN; G AE.

The QA PLAN shall be provided to the QA laboratory at least 15 business days before the initial shipment of samples.

Chemistry Data Package; G AE.

The chemistry data package shall be prepared and attached to the CDFR.

Chemical Data Final Report; G AE.

The CDFR, shall be completed and approved before final payment. Each report shall be labeled with the contract number, project name and location.

### 1.6 QUALIFICATIONS

#### 1.6.1 Chemical Quality Control Officer

As a minimum, the Contractor's Chemical Quality Control Officer shall have:  
a BS degree in Chemistry; 2 years of experience related to investigations, studies, design and remedial actions at construction sites; and one field season (or one continuous calendar year experience) in calibration and operation of various field monitoring devices as well as standard analytical chemistry methods common for analyzing soil, water, air and other materials for chemical contamination assessment. The Chemical Quality Control Officer shall ensure that all chemistry related objectives including responsibilities for DQO definitions, sampling and analysis, project requirements for data documentation and validation, and final project reports are attained. The Chemical Quality Control officer need not be present onsite during routine sampling, but shall be available for consultation with Government and Contractor personnel.

#### 1.6.2 Environmental Sampler

As a minimum, the Chemical Quality Control Officer shall instruct the Contractor's Environmental Sampler. The Environmental Sampler shall collect all onsite samples. The Environmental Sampler shall be onsite during excavation, construction and stockpiling operations involving contaminated soil or soil to be checked for contamination. The Contractor may select an appropriate employee to be the Environmental Sampler.

#### 1.7 COORDINATION MEETING

After the preconstruction conference, before any sampling or testing, the Contractor and the Contracting Officer will meet at the construction site to discuss the CQC Plan and the SAP. A list of definable features that involve chemical measurements shall be agreed upon. At a minimum, each matrix (soil, water, air, and instrumental chemical parameter measurement) shall be a definable work feature. Management of the chemical data quality system including project DQO, project submittals, chemical data documentation, chemical data assessment, required sampling and analysis protocols, and minimum data reporting requirements shall be agreed upon. The meeting will serve to establish an interrelationship between the Contractor's chemical data quality management and Government chemical quality assurance requirements. Minutes of the meeting will be documented by the Government and shall be signed by both the Contractor and the Contracting Officer. The minutes will include any or all unresolved chemical issues along with the conditions for resolution and will become a part of the contract file.

#### 1.8 MEASUREMENT AND PAYMENT

No measurement as such will be made for work performed under this section. No separate payment will be made for the work covered under this section, and all costs in connection therewith will be included in the applicable contract price to which the work pertains.

#### PART 2 PRODUCTS (NOT APPLICABLE)

#### PART 3 EXECUTION

### 3.1 GENERAL REQUIREMENTS

The Contractor shall be responsible for chemical sample acquisition, sample analysis, instrumental measurements of chemical parameters and for chemical data quality control. An effective chemical data quality control system shall be established that meets the requirements for the chemical measurement DQO applicable to the project. The system shall cover chemical measurements pertaining to and required for Contractor and subcontractor produced chemical data. The Contractor shall control field screening, sampling, and testing in conjunction with remedial activities to meet all DQO; minimize the amount of excavated material requiring temporary storage; prevent dilution of contaminated soils with clean soils; and ensure completion of work within the required time.

### 3.2 QUALITY CONTROL PLAN

#### 3.2.1 Additional Requirements

In addition, the CQC Plan shall incorporate the qualifications, authority and responsibilities of all chemical quality management and support personnel. Chemical measurements including sampling and/or chemical parameter measurement will not be permitted to begin until after production and acceptance of the CQC Plan, and Government approval of the SAP.

#### 3.2.2 Chemistry Elements of the CQC Plan

To cover contract related chemical measurements by the Contractor and all subcontractors, the CQC Plan shall include the following as a minimum.

##### 3.2.2.1 Qualifications

Names, education, experience qualifications, authorities, and decision-making responsibilities of all chemical quality management and support personnel. The CQC Plan shall contain a copy of a letter from the project QC manager designating and authorizing a Chemical Quality Control Officer and staff.

##### 3.2.2.2 Authority and Responsibility

A diagram, flow chart, or figure clearly depicting the chemical data quality management and support staff and the authority and responsibility of each for chemical sampling and analysis, procedures for corrective actions, deliverables and submittals, deviations and changes, chemical quality documentation, data validation, minimum data reporting requirements, and DQO for chemical parameter measurement by the Contractor and subcontractors. The contents of this section of the CQC Plan shall be included in the applicable "Project Organization" elements of the FSP and the QAPP.

### 3.3 SAMPLING AND ANALYSIS PLAN (SAP)

Prepare SAP to comply with CDQC requirements and EM 200-1-3. The SAP shall be a single document that contains two distinct elements: FSP and QAPP. Sections of the FSP and QAPP shall be cross referenced. The SAP shall

confirm the Contractor's understanding of the contract requirements for chemical data quality control, and shall describe procedures for field sampling and sample submittal for analysis, field chemical parameter measurement, data documentation, data assessment and data reporting requirements. The SAP shall delineate the methods the Contractor intends to use to accomplish the chemical quality control items to assure accurate, precise, representative, complete, legally defensible and comparable data. The SAP shall describe all chemical parameter measurements for all matrices for all phases of the remediation contract. As a single interrelated document, the SAP shall be provided to field and laboratory personnel. The Contractor may propose original/innovative approaches to chemical parameter measurements for cost reduction and remediation efficiency by abbreviated sampling, contingency sampling and/or contingency analysis, indicator or tracer analysis, onsite analytical services, equivalency or screening methods. The SAP shall clearly identify the Contractor obtained laboratories. The Contractor shall furnish copies of the Government approved SAP to all laboratories and the Contractor's field sampling crew. The SAP shall address all levels of the investigation with enough detail to become a document which may be used as an audit guide for field and laboratory work.

#### 3.3.1 Field Sampling Plan

The FSP shall contain necessary technical detail and direction for the field personnel to understand sampling and field measurement requirements. The FSP shall provide a comprehensive description and full detail for personnel to perform all onsite activities required to attain project DQO, including: locations of samples, sampling procedures for onsite and offsite chemical analysis, summaries of analyses to be performed on samples, shipment of samples for offsite analyses, performance of onsite and offsite instrumental parameter measurements, data documentation and reporting requirements.

#### 3.3.2 Quality Assurance Project Plan

The QAPP shall contain necessary technical detail and direction for field and laboratory personnel to understand project sample analysis, quality control and data reporting requirements, analytical methods, required detection limits, QC requirements, and data validation and reporting requirements.

#### 3.4 CHEMISTRY DATA PACKAGE

The chemistry data package shall be produced and provided through USACE CO as an attachment to the CDFR. The chemistry data package shall contain information to demonstrate that the project's DQO have been fulfilled. The QA function will compare QA sample results to corresponding primary sample results, will assess the Contractor's compliance with the SAP, and will recommend corrective action as necessary.

#### 3.5 CONTROL OF CHEMICAL DATA QUALITY

Contractor chemical data quality control shall ensure that a quality control program is in place that assures sampling and analytical activities

and the resulting chemical parameter measurement data comply with the DQO and the requirements of the SAP. The Contractor shall utilize the three-phase control system that includes a preparatory, initial and follow-up phase for each definable feature of work. The Contractor's three-phase chemical data control process shall ensure that data reporting requirements are achieved.

### 3.6 ANALYTICAL TESTING LABORATORIES

The Contractor shall propose the analytical laboratories to be used for the primary samples analyses. Laboratory validation requirements shall be in accordance with paragraph Laboratory Validation Requirements. The Contractor may utilize its own laboratory or utilize subcontract laboratories to achieve the primary required sample analyses.

#### 3.6.1 Laboratory Analytical Requirements

The Contractor shall provide the specified chemical analyses by the Contractor's laboratory. The Contractor shall provide chemical analyses to achieve the project DQO for all parameters specified by the methods. To give the USACE programs the greatest flexibility in the execution of its projects, the EPA SW-846 methods are generally the methods employed for the analytical testing of environmental samples. These methods are flexible and shall be adapted to individual project-specific requirements.

#### 3.6.2 Laboratory Performance

The Contractor shall provide continued acceptable analytical performance and shall establish a procedure to address data deficiencies noted by review and/or quality assurance sample results. The Contractor shall provide and implement a mechanism for providing analytical labs with the SAP or QAPP portion of the SAP, for monitoring the lab's performance and for performing corrective action procedures. The Contractor shall acquire analytical services with additional USACE validated laboratories in the event a project lab loses its validation status during the project.

### 3.7 CHEMICAL DATA FINAL REPORT

The CDFR shall be produced including a summary of quality control practices employed and all chemical parameter measurement activities after project completion. As a minimum, the CDFR shall contain the following:

- a. Summary of project scope and description.
- b. Summary of any deviations from the design chemical parameter measurement specifications.
- c. Summary of chemical parameter measurements performed as contingent measurements.
- d. Summary discussion of resulting data including achieving data reporting requirements.
- e. Summary of achieving project specific DQO.



- f. Presentation and evaluation of the data to include an overall assessment on the quality of the data for each method and matrix.
- g. Internal QC data generated during the project, including tabular summaries correlating sample identifiers with all blank, matrix spikes, surrogates, duplicates, laboratory control samples, and batch identifiers.
- h. A list of the affected sample results for each analyte (indexed by method and matrix) including the appropriate data qualifier flag (J, B, R, etc.), where sample results are negatively impacted by adverse quality control criteria.
- i. Summary of field and laboratory oversight activities, providing a discussion of the reliability of the data, QC problems encountered, and a summary of the evaluation of data quality for each analysis and matrix as indicated by the laboratory QC data and any other relevant findings.
- j. Conclusions and recommendations.
- k. Appendices containing: (1) Chemistry data package, and (2) Results of the Chemical Quality Assurance Report (CQAR). The CQAR is a Government produced document achieved through the inspection and analysis of QA samples and corresponding project sample data. The CQAR will include review of all QC parameters such as holding times, detection limits, method blanks, surrogate recoveries, matrix spikes and duplicates, and inter-laboratory and intra-laboratory data comparisons.

### 3.8 DOCUMENTATION

Documentation records shall be provided as factual evidence that required chemical data has been produced and chemical data quality has been achieved. The documentation shall comply with the requirements specified in paragraphs SAMPLING AND ANALYSIS PLAN, CHEMISTRY DATA PACKAGE, and CHEMICAL DATA FINAL REPORT.

### 3.9 NOTIFICATION OF NON-COMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice.

-- End of Section --

## SECTION 01451

## CONTRACTOR QUALITY CONTROL

(NYD EDITION 12/99)

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740 (1996) Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

ASTM E 329 (1995b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

## 1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the lump-sum prices contained in the Bidding Schedule.

## PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

## 3.1 GENERAL

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause entitled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both onsite and off site, and shall be keyed to the proposed construction sequence. For purposes of this section the term "construction" shall include all items of work, activities, materials and equipment as indicated in the contract documents. Other sections of the contract documents may also require separate, specially qualified individuals in such areas as chemical data acquisition, sampling and analysis, medical monitoring, industrial hygiene, safety officer, etc. The CQC organization will coordinate the activities of these individuals. The project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with quality requirements specified in the contract. The project superintendent in this context shall mean the individual with the

responsibility for the overall management of the project including quality and production.

### 3.2 QUALITY CONTROL PLAN

#### 3.2.1 General

The Contractor shall furnish for review by the Government, not later than 90 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause entitled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. The Government will consider an interim plan for the first 90 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

#### 3.2.2 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and off site, including work by subcontractors, fabricator, suppliers, and purchasing agents:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to an officer in the Contractor's organization above the Project Superintendent, who is responsible for both quality and production.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function. Clear indication that CQC System Manager will have no duties other than Quality Control.

c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters will also be furnished to the Government.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, off site fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01330 SUBMITTAL PROCEDURES.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting

Officer.) The Contractor shall incorporate all tests required by the contract (including systems commissioning and operating tests) to derive the above list of testing information which shall be presented in matrix form as part of the CQC Plan. This matrix shall be suitable for use by the Contractor and the Government as a checklist to control testing to be done on the contract. Coordinate any additional test submission or plan requirements for Mechanical and Electrical Systems with appropriate specialized specification section if applicable.

f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation. Provide matrix of Preparatory and Initial Inspections including specification reference paragraph, the name of the Definable Feature of Work, and spaces for date performed, results, and names of attendees.

g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.

h. Reporting procedures, including proposed reporting formats.

i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks and has separate control requirements. It could be identified by different trades or disciplines, or it could be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there is frequently more than one definable feature under a particular section. This list will cover all features of work on the project, and will be agreed upon during the coordination meeting.

j. A brief explanation of the duties of the CQC organization with respect To safety. Note that separate Accident Prevention Plan and Hazards Analysis is required for submission and acceptance.

k. Contractor's plan for training all CQC personnel in the CQC System.

### 3.2.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

### 3.2.4 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

## 3.3 COORDINATION MEETING

After the Pre-construction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of 14 calendar days prior to the Coordination Meeting. The initial plan submitted must be found acceptable by the Government before the Coordination Meeting can be held. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and off site work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

### 3.4 QUALITY CONTROL ORGANIZATION

#### 3.4.1 General

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure contract compliance. The number of CQC personnel shall be increased as required during times of high construction workload. The Contractor shall provide a CQC organization which shall be at the site at all times during progress of the work and with complete authority to take any action necessary to ensure compliance with the contract. All CQC staff members shall be subject to acceptance by the Contracting Officer.

#### 3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within his organization at the site of the work who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, or a graduate of construction management, or shall hold a state Professional Engineer's license, with a minimum of 2 years construction experience on construction similar to this contract, one year of which as a Quality Control Representative. The CQC Manager may also be a construction person with a minimum of 4 years in related work, one year of which as a QC Representative. This CQC System Manager shall be on the site at all times during construction and will be employed by the prime Contractor. An alternate for the CQC System Manager will be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate will be the same as for the designated CQC System Manager. The CQC System Manager shall be assigned no duties other than Quality Control.

#### 3.4.3 Organizational Expertise

The CQC organization, which includes the CQC System Manager and additional qualified personnel, must as a minimum possess general corporate

technical knowledge of all aspects of the project, and must successfully execute the CQC System on all aspects of the project. Individuals possessing experience in specialized areas shall be added to the organization as required during periods when such specialty areas are being executed. Examples of such specialized areas would include HVAC, electrical distribution and substations, roofing, tele-communication systems, fire protection and alarm systems, computer installations, specialized welding, specialized finishes, precast concrete installation, modular housing, specialized geotech work, dredging, sand placement and surveying, chemical data acquisition, hazardous material removal and disposal, medical monitoring, etc., depending on the nature of the particular project. The Contractor must demonstrate that such additional qualified personnel have received sufficient training and indoctrination into the CQC system, and that these personnel properly execute the requirements of the CQC System within their areas of expertise.

#### 3.4.4 Additional Requirement

In addition to the above experience and education requirements the CQC System Manager shall have completed within the last five years the course entitled "Construction Quality Management for Contractors". This course is given at a cost of \$25 by Government personnel and is of two-day duration. The Government will provide one instruction manual for the course.

#### 3.4.5 Organizational Changes

The Contractor shall maintain the CQC Organization at full strength at all times. When it is necessary to make changes to the organization, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

### 3.5 SUBMITTALS

Submittals shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements and are submitted in accordance with the date on the submittal register. CQC personnel shall also make physical checks of materials and equipment before installation to insure compliance with approved shop drawings.

### 3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

#### 3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work after all required plans/documents/materials are approved/accepted, and after copies are at the worksite, and shall include:

- a. A review of each paragraph of applicable specifications.
- b. A review of the contract drawings.
- c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
- f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- g. A review of the appropriate activity hazard analysis to assure safety requirements are met per EM 385-1-1, "Safety and Health Requirements Manual".
- h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
- i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- j. Discussion of the initial control phase.
- k. The Government shall be notified at least 48 hours in advance of beginning the preparatory control phase meeting. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall clearly indicate its intent and plan for communication of the results of the preparatory phase to applicable workers, to include materials, construction methods, workmanship standards, safety considerations and procedures, and preparatory phase meeting minutes.

#### 3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work (DFW) when the accomplishment of a representative sample of the work is impending. The following shall be accomplished:

- a. A check of the portion of work done to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

d. Resolve all differences.

e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

f. The Government shall be notified at least 48 hours in advance of beginning the initial phase meeting. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), the foreman responsible for the definable feature and the work crew(s) for the appropriate DFW. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location (i.e. CQC Report number) of initial phase shall be indicated for future reference and comparison with follow-up phases.

g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

#### 3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon or conceal non-conforming work.

#### 3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable feature of work if the quality of on-going work is unacceptable, if there are changes in the applicable CQC staff, onsite production supervision or work crew, if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

#### 3.6.5 Definable Feature of Work: Definition and Discussion

A Definable Feature of Work (DFW) is a portion of work consisting of materials, equipment, supplies and procedures which are closely related to each other, have the same control and will be accomplished by the same work crew to completion. A DFW must be sufficiently small so that control of the work (i.e. communication of requirements to workers, inspection of materials and workmanship and correction of deficiencies) will be easily accomplished. Some examples are:

- \* Rough-in of electrical boxes and wiring methods
- \* Lighting fixtures, receptacles, and accessories



- \* Panelboards, circuit breakers and motors.
- \* Water supply piping, fittings and supports
- \* Trench excavations, backfill and compaction
- \* Concrete reinforcement and formwork
- \* Concrete mixing, placement, curing and finishing
- \* Embankment, Grading and Compaction
- \* Concrete demolition, removal and disposal
- \* Bituminous concrete placement and Compaction
- \* Chemical Data Acquisition
- \* Preparation, removal and disposal of contaminated material
- \* Dredging and placement.

### 3.7 TESTS

#### 3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a laboratory which has been assurance inspected by the Corps of Engineers within the last two years. The Contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Results of all tests taken, both passing and failing tests, will be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test will be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test

number and date taken. An information copy of tests performed by an off site or commercial test facility will be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

### 3.7.2 Testing Laboratories

#### 3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment and calibration in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, aggregate and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329. The Government requires a Corps of Engineers capability check of the laboratory which the contractor proposes to perform tests on soils, concrete, asphalt, aggregate and steel. If the laboratory proposed has not had the required Corps of Engineers capability check within the the last two years, it will be performed by the Corps of Engineers at a cost of \$7200 to the Contractor. This cost will be paid by the Contractor via check directly to the Corps of Engineers Laboratory performing the inspection and report.

#### 3.7.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge of \$7200 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory.

### 3.7.3 On-Site Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

### 3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials will be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered to the Corps of Engineers Division Laboratory, as designated by the Government Representative. Coordination for each specific test, exact delivery location and dates will be made through the Area Office.

## 3.8 COMPLETION INSPECTION

### 3.8.1 Punch-Out Inspection

Near the completion of all work or any increment thereof established by a completion time stated in the Special Contract Requirement paragraph entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in

the specifications, the CQC System Manager shall conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected.

The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished the Contractor shall notify the Government that the facility is ready for the Government's "Pre-final" inspection.

#### 3.8.2 Pre-Final Inspection

The Government will perform this inspection to verify that the facility is ready to be occupied. A Government "Pre-final Punch List" will be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected and so notify the Government so that a "Final" inspection with the customer can be scheduled. Any items noted on the "Pre-final" inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph will be accomplished within the time slated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

#### 3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person and the Contracting Officer's representative will be in attendance at this inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final Inspection. Notice will be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being acceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause entitled "Inspection of Construction".

#### 3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment with hours worked, idle, or down for repair.

c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.

e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.

f. Submittals reviewed, with contract reference, by whom, and action taken.

g. Off-site surveillance activities, including actions taken.

h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

i. Instructions given/received and conflicts in plans and/or specifications.

j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. "N/A" shall be entered into any field for which no entry is intended. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 16 hours after the date(s) covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every seven days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel. All documentation is expected to be literate, legible and complete.

### 3.10 SAMPLE FORMS

(Note: If the Resident Management System (RMS) is required to be used by the contractor for the QC System as indicated elsewhere in this contract, Contractor will generate all reports in the RMS System, and attached forms will serve as guidance only. Otherwise forms contained herein will be used by the by CQC Staff for CQC System reporting).

a. The 2-page form at the end of the section will be used for the basic CQC Report. CQC personnel shall attach continuation sheets as required for any entries which cannot fit on the basic form. Preparatory and Initial

Inspections, when performed, shall be indicated on the basic CQC report and minutes for each inspection shall be attached. Minutes will consist of a list of specific requirements for materials, procedures or equipment to be employed and shall also include any understandings reached or items of special importance discussed.

b. In addition, outstanding deficiencies shall be listed on the form "List of Outstanding Deficiencies" at the end of this section and shall be attached to each CQC report. As deficiencies are corrected, they are to be acknowledged on the basic CQC report and shall be deleted from the list.

c. Form at the end of this section entitled "CQC Test Report List" shall be used by the Contractor to track testing to be done as the project progresses, and also to summarize the Contractor's Quality Control testing to be reported on the CQC Plan.

d. Form "Record of Preparatory and Initial Inspections" at the end of this section shall be used by the Contractor to track Preparatory and Initial inspections as the project progresses and also to summarize these required inspections as part of the CQC Plan.

e. Additional reporting forms pertaining to specialized activities may be included herein or elsewhere in the contract, and shall be used for reporting as indicated.

### 3.11 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor. Deficiencies cited and verbal instructions given to the Contractor by the Government Representative shall be entered into that day's CQC Report.

(FORMS FOLLOW)

-- End of Section --

RECORD OF PREPARATORY AND INITIAL INSPECTIONS

DATE OF INSP	TYPE OF INSP	DEFINABLE FEATURE OF WORK (DESCRIBE)	REPORT NOS		PERSONS ATTENDING INSP	WAS MATL&/OR EQUIPMENT PHYSICALLY INSPECTED ?
			QA	QC		

NAD FORM 826

22 JULY 86

NOTE: THIS FORM SHALL BE USED BY THE CONTRACTOR TO TRACK PREP/INIT INSP'S  
ATTACH ADDITIONAL RESULTS OR COMMENTS AS REQUIRED

# LIST OF OUTSTANDING DEFICIENCIES

DATE: \_\_\_\_\_

SH \_\_\_\_\_ OF \_\_\_\_\_

PROJECT TITLE: \_\_\_\_\_ CONTRACTOR: \_\_\_\_\_

LOCATION: \_\_\_\_\_ CQC REPORT# \_\_\_\_\_ CONTRACT #:

SPEC REF OR DWG#	LOCATION ON PROJECT	DESCRIPTION OF DEFICIENCY	DATE FOUND	DATE TO BE CORRECTED	DATE CORRECTED	REMARKS

NOTE: THIS FORM SHALL BE USED BY THE CONTRACTOR TO TRACK OUTSTANDING CONSTRUCTION DEFICIENCIES

# CQC TEST REPORT LIST

CQC REPORT# \_\_\_\_\_ SH \_\_\_\_\_ OF \_\_\_\_\_ DATE: \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_ CONTRACT #: \_\_\_\_\_

PROJECT TITLE: \_\_\_\_\_ LOCATION: \_\_\_\_\_

SPEC REF OR DWG#	TYPE OF TEST	DATE PERFORMED	RESULTS	REMARKS

NOTE: THIS FORM SHALL BE USED BY THE CONTRACTOR TO TRACK CQC TESTING. PROVIDE ATTACHMENTS AS REQUIRED.



**CQC REPORT #** \_\_\_\_\_

**Date** \_\_\_\_\_

1. Project Title: \_\_\_\_\_

Location: \_\_\_\_\_ Contract No.: \_\_\_\_\_

2. List Contractors and Subs Working This Day and Areas of responsibility of each

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3. Weather:

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4. Description and Location of Work of the Project (Also indicate days of no work and reasons for delay)

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5. Labor and Equipment Breakdown by Trade (Attach Continuation)

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6. Preparatory Phase Inspections Held (See Attached Minutes)

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7. Initial Phase Inspections Held (See attached minutes)

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☐ a. Testing Performed. Attach Results.      ☐ d. Outstanding Deficiencies. See Attached List  
☐ b. Verbal Instructions Received.      ☐ e. Delivery of Equipment and Materials.  
☐ c. Submittal Actions.      ☐ f. Misc/Remarks.

(Use Space Below To Discribe Checked Items)

[illegible]

Signed \_\_\_\_\_ Date \_\_\_\_\_  
CQC Representative

01451 - 17

## SECTION 01453

CONTRACTOR WARRANTY MANAGEMENT  
02/99

## PART 1 GENERAL

## 1.1 REFERENCES

- a. Clause "Warranty of Construction", (FAR 52.246-0021)
- b. Clause "Inspection of Construction" (FAR 52.246-12)
- c. Special Requirement paragraph entitled "Record Drawings"
- d. Specification Section entitled "Contractor Quality Control"

## 1.2 GENERAL

In order to insure that the Government systematically receives all warranties of construction, equipment and systems to which it is entitled, the contractor shall execute all actions as required by above references and as contained herein.

## 1.3 POST-COMPLETION INSPECTIONS

For purposes of management of construction warranties, the Government conducts four and nine month warranty inspections with using agencies. The Contractor is encouraged to attend these inspections in order to better manage any warranty items for which it may be responsible.

## 1.4 TAGGING OF EXTENDED WARRANTY ITEMS

The Contractor shall install tags to identify items protected by extended warranty, i.e. longer than the one year general warranty of construction. The tags shall be minimum 3 inches by 5 inches in size, machine-printed in minimum 14-point type, and shall be weatherproof. Tags shall be attached to equipment if accessible or to accessible control panel, etc. As a minimum, tags shall indicate the following information:

"Extended Warranty Item:"

Name of Item

Name of System with which associated, number designation within system, or other identifier

Model Number

Serial Number

Start and end Dates of Warranty

Contract number

Contract Name

Contractor Name

Point of Contact name, organization and telephone number.

### 1.5 POSTING OF INSTRUCTIONS

In addition to any posting of operating procedures as may be required elsewhere in this contract, any equipment or system for which proper operation or maintenance is critical in order to preserve warranties, prevent damage, or for reasons of safety shall have proper operating procedures posted near the equipment or near the operating point. Instructions shall be protected by 1/16 inch thick plastic sheet. As a minimum such equipment or system shall include:

- Electrical Substations
- Transformers
- Electrical Generators
- Major HVAC System components including chillers, air-handlers, fans, etc.
- HVAC Control Panel
- Boilers
- Air Compressors

### 1.6 WARRANTY MEETING

At least 14 days prior to the 80% completion point of this contract (or deliverable phase thereof ), the contractor will notify the Government representative for the purpose of scheduling a meeting to clarify understandings of responsibilities with respect to warranties to which the Government is entitled. The Government and contractor shall attend the warranty meeting, as well as any subcontractors, or suppliers involved in the warranty process. The Warranty Plan (below) shall have already been submitted and approved by the Government before the warranty meeting can take place, and shall be the basis of the meeting's agenda.

### 1.7 WARRANTY PLAN

At least 30 days before the planned warranty meeting, the contractor shall submit a warranty plan for Government approval per section "Submittals". The Warranty Plan shall include all required actions and documents to assure that the Government receives all warranties to which it is entitled.

The plan shall be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below shall include due date and whether item has been submitted or was accomplished. As a minimum the plan shall indicate:

- a. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the contractor's, subcontractors or suppliers involved.
- b. Listing and status of O&M manuals and As-built drawings, and expected delivery dates.
- c. Listing and status of all training to be provided to Government personnel, whether specified by contract or required by manufacturers.

d. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and for all commissioned systems such as fire protection and alarm systems, sprinkler systems, lightning protection systems, etc.

e. A list for each warranted equipment, item, feature of construction or system indicating:

- Name of item
- Model and serial numbers.
- Location where installed
- Names of manufacturers or, suppliers and phone numbers.
- Names addresses and telephone numbers of sources of spare parts
- Warranties and terms of warranty. This shall include one-year overall warranty of construction as required by ref. 1.a. Clearly indicate which items have extended warranties.
- Cross-reference to warranty certificates as applicable
- Starting point and duration of warranty period.
- Summary of maintenance procedures required to continue the warranty in force.
- Cross-reference to specific pertinent Operation and Maintenance manuals
- Organization, names and phone numbers of persons to call for warranty service
- Typical response time and repair time expected for various warranted equipment

f. The contractor's plans for attendance at the Four and Nine month post-construction warranty inspections conducted by the Government.

g. Procedure and status of tagging of all equipment covered by extended warranties.

h. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons

-- End of Section --

## SECTION 01501

## PROTECTION AND MAINTENANCE OF TRAFFIC

## Item No. 1 - Maintenance and Protection of Traffic

## PART 1 GENERAL

## 1.1 PROTECTION AND MAINTENANCE OF TRAFFIC

## 1.1.1 General Requirements

During construction the Contractor shall provide a right-of-way for roads and intersecting access roads. In addition, the Contractor shall provide temporary relocated roads as necessary to provide the required right-of-way. The Contractor shall maintain and protect traffic on existing adjacent highway until the completion of the work. All measures for the protection and diversion of traffic, including the provision of watchman and flag men, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by state and local authorities having jurisdiction. Traffic will be maintained continuously for the duration of the contract and the travelling public shall be protected from all damage to persons and property.

## 1.1.2 Haul Roads

The Contractor's traffic on roads that he may elect to use for hauling material to and from the site, shall interfere as little as possible with public traffic. The Contractor shall make his own investigation of the adequacy of existing roads and the allowable load limit on these roads. He shall be responsible for the repair of any damage to roads caused by his operations without expense to the Government.

## 1.1.3 Maintenance of Traffic

Traffic shall be maintained continuously on all roads during the construction period except as otherwise specifically directed by the Contracting Officer.

-- End of Section --

## SECTION 01502

## STREAM DIVERSION AND DEWATERING

## Item No. 2 - Stream Diversion and Dewatering

a

## PART 1 GENERAL

## 1.1 GENERAL REQUIREMENTS

## 1.1.1 Permanent Work

All permanent work shall be carried on in areas free from water. The Contractor shall design, construct and maintain all necessary temporary coffer dams and other protective measures, shall make provisions for diversion of the stream, shall furnish and place all materials therefor, and shall furnish, install, maintain and operate all necessary diversion channels, pumping plants bypass piping and other equipment for dewatering the various parts of the work. The Contractor shall be solely responsible for the safety of the work. All temporary protective works shall be removed before acceptance of the work under this Construction Contract.

## PART 2 PROTECTIVE MEASURES

## 2.1 CONTRACTOR PROPOSAL

The Contractor shall prepare methods and designs that generally describe protective measures which he proposes. This shall be submitted to the Contracting Officer for approval prior to execution. The design shall be sensitive to the needs of environmental protection and the requirements for soil erosion and sedimentation control. However, the approval of the Contracting Officer shall not relieve the Contractor from full responsibility for the adequacy of the protective measures. Any damage to any part of the work shall be repaired as stipulated in the Special Contract Requirements and Contract Clauses.

-- End of Section --

## SECTION 01572

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT  
07/00

## PART 1 GENERAL

## 1.1 GENERAL WASTE MANAGEMENT

Contractor shall practice efficient waste management during construction, when sizing, cutting, and installing products and materials and use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse.

## 1.2 MANAGEMENT

The Contractor shall take a pro-active, responsible role in the management of construction waste and require all subcontractors, vendors, and suppliers to participate in the effort. Construction waste includes products of landfill wastes, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work. In the management of waste, consideration shall be given to the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates. The Contractor shall be responsible for implementation of special programs involving rebates or similar incentives related to recycling of waste. Revenues or other savings obtained for salvage, or recycling shall accrue to the Contractor. Firms and facilities used for recycling, reuse, and disposal shall be appropriately permitted for the intended use to the extent required by federal, state, and local regulations.

## 1.3 WASTE MANAGEMENT PLAN

A waste management plan shall be submitted within 15 days after Notice to Proceed and prior to initiating any site preparation work. The plan shall include the following:

- a. Names of individuals on the Contractor's staff responsible for waste prevention and management.
- b. Actions that will be taken to reduce solid waste generation and handle disposal of excavated landfill waste.
- c. Description of the specific approaches to be used in excavation and disposal of landfill wastes, recycling and reuse of the various materials excavated or generated along with identification of areas and equipment to be used for processing, sorting, and temporary storage of wastes.
- d. Characterization, including estimated types and quantities, of the waste to be excavated or generated.



- e. Names of landfills and/or incinerators to be used and the estimated costs for use, assuming portions of the wastes on the project could not be salvaged or recycled.
- f. Identification of local and regional reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity.
- g. List of specific waste materials that will be salvaged for resale, salvaged and reused, or recycled. Recycling facilities that will be used shall be identified.
- h. Identification of materials that cannot be recycled or reused with an explanation or justification.
- i. Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the materials and the incineration and/or landfill cost avoidance.

#### 1.4 RECORDS

Records shall be maintained to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. The records shall be made available to the Contracting Officer during construction, and a copy of the records shall be delivered with final project documentation to the Contracting Officer.

#### 1.5 COLLECTION

The necessary containers, bins and storage areas to facilitate effective waste management shall be provided and shall be clearly and appropriately identified by the Contractor. Recyclable materials shall be handled to prevent contamination of materials from incompatible products and materials and separated by one of the following methods:

##### 1.5.1 Source Separated Method.

Waste products and materials that are recyclable shall be separated from trash, sorted into appropriately marked areas, placed in individual containers or storage areas and then transported to the respective recycling facility for further processing.

##### 1.5.2 Co-Mingled Method.

Co-mingled wastes shall not be permitted except excavated landfill wastes.

##### 1.5.3 Other Methods.

Other methods proposed by the Contractor may be used when approved by the Contracting Officer.

## 1.6 DISPOSAL

Except as otherwise specified in other sections of the specifications, disposal shall be in accordance with the following:

### 1.6.1 Reuse.

First consideration shall be given to salvage for reuse. Second consideration shall be given for the sale or donation of waste suitable for reuse. Salvaged materials shall not be used in this project except for those specified in other sections to be salvaged and reinstalled.

### 1.6.2 Recycle.

Waste materials not suitable for reuse, but having value as being recyclable, shall be made available for recycling whenever economically feasible.

### 1.6.3 Waste.

Materials with no practical use or economic benefit shall be disposed at a landfill or incinerator.

## 1.7 MEASUREMENT AND PAYMENT

### 1.7.1 Measurement

No measurement as such will be made for work performed under this section.

### 1.7.2 Payment

No separate payment will be made for the work covered under this section, and all costs in connection therewith will be included in the applicable contract price to which the work pertains.

-- End of Section --

## SECTION 02221

EXCAVATION, FILLING AND BACKFILLING FOR STRUCTURES  
03/91

Item No. 5 - Excavation, Commonw

Item No. 7 - Compacted Fill, Common

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil, and Rock
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 2937	(1994) Density of Soil in Place by the Drive-Cylinder Method
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1993) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

## 1.2 DEFINITIONS

### 1.2.1 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated hereinafter as percent laboratory maximum density.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-09 Reports

Field Density Tests; G AE. Testing of Backfill Materials; G AE.

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Satisfactory Materials

Satisfactory materials include materials classified in ASTM D 2487 as GW, GP, SW, SP, SM, and GM and shall be free of trash, debris, roots or other organic matter, or stones larger than 3 inches in any dimension.

#### 2.1.2 Unsatisfactory Materials

Unsatisfactory materials include materials classified in ASTM D 2487 as Pt, OH, OL, MH, and CH and any other materials not defined as satisfactory.

#### 2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.

## PART 3 EXECUTION

### 3.1 CLEARING AND GRUBBING

Clearing and grubbing is specified in Section 02110 CLEARING AND GRUBBING. Materials removed shall be disposed of outside the limits of Government-controlled property at the Contractor's responsibility.

### 3.2 TOPSOIL

Topsoil shall be stripped to a depth of 12 inches below existing grade within the designated excavations and grading lines and deposited in storage piles for later use. Excess topsoil shall be disposed as specified

for excess excavated material.

### 3.3 EXCAVATION

Excavation shall conform to the dimensions and elevations indicated for each structure, and footing except as specified hereinafter, and shall include trenching for utility and foundation drainage systems to a point 5 feet beyond the line of each structure, excavation for outside and all work incidental thereto. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed and replaced with satisfactory material. Payment therefor will be made in conformance with the CHANGES clause of the CONTRACT CLAUSES. Satisfactory material removed below the depths indicated without specific direction of the Contracting Officer shall be replaced at no additional cost to the Government to the indicated excavation grade with satisfactory materials, except that concrete footings shall be increased in thickness to the bottom of the overdepth excavations and over-break in rock excavation. Satisfactory material shall be placed and compacted as specified in paragraph FILLING AND BACKFILLING. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

### 3.4 DRAINAGE AND DEWATERING

#### 3.4.1 Drainage

Surface water shall be directed away from excavation and construction sites so as to prevent erosion and undermining of foundations. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site and the area immediately surrounding the site and affecting operations at the site shall be continually and effectively drained.

#### 3.4.2 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least 2 feet below the working level.

### 3.5 SHORING

Shoring, including sheet piling, shall be furnished and installed as necessary to protect workmen, banks, adjacent paving, structures, and utilities. Shoring, bracing, and sheeting shall be removed as excavations are backfilled, in a manner to prevent caving.

### 3.6 CLASSIFICATION OF EXCAVATION

Excavation will be unclassified regardless of the nature of material encountered.

### 3.7 BLASTING

Blasting will not be permitted.

### 3.8 UTILITY AND DRAIN TRENCHES

Trenches for underground utilities systems and drain lines shall be excavated to the required alignments and depths. The bottoms of trenches shall be graded to secure the required slope and shall be tamped if necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length. Rock, where encountered, shall be excavated to a depth of at least 6 inches below the bottom of the pipe, and the overdepth shall be backfilled with satisfactory material placed and compacted in conformance with paragraph 3.13 FILLING AND BACKFILLING.

### 3.9 BORROW

Where satisfactory materials are not available in sufficient quantity from required excavations, approved materials shall be obtained as specified in Section 02331 LEVEE CONSTRUCTION.

### 3.10 EXCAVATED MATERIALS

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required under this section or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Section 02331 LEVEE CONSTRUCTION.

### 3.11 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Excavation to final grade shall not be made until just before concrete is to be placed. For pile foundations, the excavation shall be stopped at an elevation of from 6 to 12 inches above the bottom of the footing before driving piles. After pile driving has been completed, the remainder of the excavation shall be completed to the elevations shown. Approximately level surfaces shall be roughened, and sloped surfaces shall be cut as indicated into rough steps or benches to provide a satisfactory bond. Shales shall be protected from slaking or other erosion resulting from ponding or flow of water.

### 3.12 SUBGRADE PREPARATION

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to plus or minus 3 percent of optimum moisture. Minimum subgrade density shall be as specified in paragraph 3.1.3 FILLING AND BACKFILLING.

### 3.13 FILLING AND BACKFILLING

Satisfactory materials shall be used in bringing fills and backfills to the lines and grades indicated and for replacing unsatisfactory materials. Satisfactory materials shall be placed in horizontal layers not exceeding 8 inches in loose thickness, or 6 inches when hand-operated compactors are used. After placing, each layer shall be plowed, disked, or otherwise broken up, moistened or aerated as necessary, thoroughly mixed and compacted as specified. Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Backfill shall be brought to indicated finish grade and shall include backfill for outside grease interceptors and underground fuel tanks. Backfill shall not be placed in wet or frozen areas. Where pipe is coated or wrapped for protection against corrosion, the backfill material up to an elevation 2 feet above sewer lines and 1 foot above other utility lines shall be free from stones larger than 1 inch in any dimension. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall. Each layer of fill and backfill shall be compacted to not less than the percentage of maximum density specified below:

	Percent Laboratory maximum density	
	Cohesive material	Cohesionless material
Fill, embankment, and backfill		
Under structures, steps, around footings, and in trenches	90	95
Under grassed areas	85	95
Subgrade		
Under structures and top 12 inches	90	95

Approved compacted subgrades that are disturbed by the Contractor's operations or adverse weather shall be scarified and compacted as specified herein before to the required density prior to further construction thereon.

### 3.14 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory or may be performed by the Contractor subject to approval. Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2167, or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted if necessary by the procedure described in ASTM D 2922, paragraph ADJUSTING CALIBRATION CURVE. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. ASTM D 2937 shall be used only for soft, fine-grained, cohesive soils. The following number of tests, if performed at the appropriate time, shall be the minimum acceptable for each type operation.

#### 3.14.1 In-Place Densities

##### 3.14.1.1 In-Place Density of Subgrades

One test per 1000 square foot or fraction thereof.



#### 3.14.1.2 In-Place Density of Fills and Backfills

One test per 1000 square foot or fraction thereof of each lift for fill or backfill areas compacted by other than hand or hand-operated machines. The density for each lift of fill or backfill materials for trenches, pits, or other structures or areas less than 5 feet in width, which are compacted with hand or hand-operated machines shall be tested as follows: One test per each area less than 1000 square feet, or one test for each 100 linear foot of long narrow fills 500 feet or more in length. If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 as follows: One check per lift for each 3000 linear feet of long narrow fills, and a minimum of 1 check per lift for other fill and backfill areas.

#### 3.14.2 Moisture Content

In the stockpile, excavation or borrow areas, a minimum of two tests per day per type of material or source of materials being placed is required during stable weather conditions. During unstable weather, tests shall be made as dictated by local conditions and approved moisture content shall be tested in accordance with ASTM D 2216.

#### 3.14.3 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 250 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density will be made.

#### 3.15 GRADING

Areas within 5 feet outside of each structure line shall be constructed true-to-grade, shaped to drain, and shall be maintained free of trash and debris until final inspection has been completed and the work has been accepted.

#### 3.15 SPREADING TOPSOIL

Areas outside the building lines from which topsoil has been removed shall be topsoiled. The surface shall be free of materials that would hinder planting or maintenance operations. The subgrade shall be pulverized to a depth of 2 inches by disking or plowing for the bonding of topsoil with the subsoil. Topsoil shall then be uniformly spread, graded, and compacted to the thickness, elevations, slopes shown, and left free of surface irregularities. Topsoil shall be compacted by one pass of a cultipacker, roller, or other approved equipment weighing 100 to 160 pounds per linear foot of roller. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to seeding, planting, or proper grading.

#### 3.16 PROTECTION

Settlement or washing that occurs in graded, topsoiled, or backfilled areas prior to acceptance of the work shall be repaired and grades reestablished

to the required elevations and slopes.

-- End of Section --

## SECTION 02300

## EARTHWORK

**12/97**

Item No. 5 - Excavation Common  
Item No. 6 - Excavation Stripping  
Item No. 7 - Compacted Fill, Common

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 422	(1963; R 1998) Particle-Size Analysis of Soils
ASTM D 1140	(1997) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 2937	(1994) Density of Soil in Place by the Drive-Cylinder Method
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow

Depth)

ASTM D 4318

(1998) Liquid Limit, Plastic Limit, and  
Plasticity Index of Soils

## 1.2 DEFINITIONS

### 1.2.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC, CL, ML, CL-ML. Satisfactory materials for grading shall be comprised of stones less than 8 inches, except for fill material for pavements and railroads which shall be comprised of stones less than 3 inches in any dimension.

### 1.2.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. The Contracting Officer shall be notified of any contaminated materials.

### 1.2.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Testing required for classifying materials shall be in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and ASTM D 1140.

### 1.2.4 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated as a percent of laboratory maximum density.

### 1.2.5 Topsoil

Material suitable for topsoils obtained from offsite areas and excavations are defined as soils that will be able to support plant life.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-08 Statements

Earthwork; G.

Procedure and location for disposal of unused satisfactory material.  
Blasting plan when blasting is permitted. Proposed source of borrow material.

#### SD-09 Reports

Testing; G.

Within 24 hours of conclusion of physical tests, 3 copies of test results, including calibration curves and results of calibration tests.

#### SD-13 Certificates

Testing; G.

Qualifications of the commercial testing laboratory or Contractor's testing facilities.

#### SD-18 Records

Earthwork; G.

Notification of encountering rock in the project. Advance notice on the opening of excavation or borrow areas. Advance notice on shoulder construction for rigid pavements.

### 1.4 SUBSURFACE DATA

Subsurface soil boring logs are shown on the drawings. The subsoil investigation report and samples of materials taken from subsurface investigations may be examined at Caven Point Marine Terminal, Soils Warehouse, Foot of Chapel Avenue, Jersey City, N.J.. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations.

### 1.5 CLASSIFICATION OF EXCAVATION

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

#### 1.5.1 Common Excavation

Common excavation shall include the satisfactory removal and disposal of all materials not classified as rock excavation.

### 1.6 BLASTING

Blasting will not be permitted.

### 1.7 UTILIZATION OF EXCAVATED MATERIALS

Unsatisfactory materials removed from excavations shall be disposed of in

designated waste disposal or spoil areas. Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. No satisfactory excavated material shall be wasted without specific written authorization. Satisfactory material authorized to be wasted shall be disposed of in designated areas approved for surplus material storage or designated waste areas as directed. Newly designated waste areas on Government-controlled land shall be cleared and grubbed before disposal of waste material thereon. Coarse rock from excavations shall be stockpiled and used for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. No excavated material shall be disposed of to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

## PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

### 3.1 STRIPPING OF TOPSOIL

Where indicated or directed, topsoil shall be stripped to a depth of 12 inches. Topsoil shall be spread on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations. Any surplus of topsoil from excavations and grading shall be removed from the site.

### 3.2 GENERAL EXCAVATION

The Contractor shall perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with the typical sections shown and the tolerances specified in paragraph FINISHING. Satisfactory excavated materials shall be transported to and placed in fill or embankment within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials as directed. Such excavated material and the satisfactory material ordered as replacement shall be included in excavation. Surplus satisfactory excavated material not required for fill or embankment shall be disposed of in areas approved for surplus material storage or designated waste areas. Unsatisfactory excavated material shall be disposed of in designated waste or spoil areas.

During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill or embankment in excess of that produced by excavation within the grading limits shall be excavated from the borrow areas indicated or from other approved areas selected by the Contractor as specified.

### 3.2.1 Ditches, Gutters, and Channel Changes

Excavation of ditches, gutters, and channel changes shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. Ditches and gutters shall not be excavated below grades shown. Excessive open ditch or gutter excavation shall be backfilled with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Material excavated shall be disposed of as shown or as directed, except that in no case shall material be deposited less than 4 feet from the edge of a ditch. The Contractor shall maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

### 3.2.2 Drainage Structures

Excavations shall be made to the lines, grades, and elevations shown, or as directed. Trenches and foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm, level, stepped, or serrated surface. Loose disintegrated rock and thin strata shall be removed. When concrete or masonry is to be placed in an excavated area, the bottom of the excavation shall not be disturbed. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed. Where pile foundations are to be used, the excavation of each pit shall be stopped at an elevation 1 foot above the base of the footing, as specified, before piles are driven. After the pile driving has been completed, loose and displaced material shall be removed and excavation completed, leaving a smooth, solid, undisturbed surface to receive the concrete or masonry.

### 3.3 SELECTION OF BORROW MATERIAL

Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from the borrow areas shown or from other approved sources, either private or within the limits of the project site, selected by the Contractor. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling. Borrow material from approved sources on Government-controlled land may be obtained without payment of royalties. Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon shall be considered related operations to the borrow excavation.

### 3.4 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS

The Contractor shall notify the Contracting Officer sufficiently in advance of the opening of any excavation or borrow pit to permit elevations and measurements of the undisturbed ground surface to be taken. Except as otherwise permitted, borrow pits and other excavation areas shall be

excavated providing adequate drainage. Overburden and other spoil material shall be transported to designated spoil areas or otherwise disposed of as directed. Borrow pits shall be neatly trimmed and drained after the excavation is completed. The Contractor shall ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

### 3.5 GRADING AREAS

Where indicated, work will be divided into grading areas within which satisfactory excavated material shall be placed in embankments, fills, and required backfills. The Contractor shall not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing.

### 3.6 BACKFILL

Backfill adjacent to any and all types of structures shall be placed and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials to prevent wedging action or eccentric loading upon or against the structure. Ground surface on which backfill is to be placed shall be prepared as specified in paragraph 3.7 PREPARATION OF GROUND SURFACE FOR EMBANKMENTS. Compaction requirements for backfill materials shall also conform to the applicable portions of paragraphs 3.7 PREPARATION OF GROUND SURFACE FOR EMBANKMENTS, 3.8 EMBANKMENTS, and 3.9 SUBGRADE PREPARATION, and Section 02630 STORM-DRAINAGE SYSTEM; and Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

### 3.7 PREPARATION OF GROUND SURFACE FOR EMBANKMENTS

#### 3.7.1 General Requirements

Ground surface on which fill is to be placed shall be stripped of live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material; plowed, disked, or otherwise broken up to a depth of 6 inches; pulverized; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of embankment materials to assure adequate bond between embankment material and the prepared ground surface.

#### 3.7.2 Frozen Material

Embankment shall not be placed on a foundation which contains frozen material, or which has been subjected to freeze-thaw action. This prohibition encompasses all foundation types, including the natural ground, all prepared subgrades (whether in an excavation or on an embankment) and



all layers of previously placed and compacted earth fill which become the foundations for successive layers of earth fill. All material that freezes or has been subjected to freeze-thaw action during the construction work, or during periods of temporary shutdowns, such as, but not limited to, nights, holidays, weekends, winter shutdowns, or earthwork operations, shall be removed to a depth that is acceptable to the Contracting Officer and replaced with new material. Alternatively, the material will be thawed, dried, reworked, and recompact to the specified criteria before additional material is placed. The Contracting Officer will determine when placement of fill shall cease due to cold weather. The Contracting Officer may elect to use average daily air temperatures, and/or physical observation of the soils for his determination. Embankment material shall not contain frozen clumps of soil, snow, or ice.

### 3.8 EMBANKMENTS

#### 3.8.1 Earth Embankments

Earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. The material shall be placed in successive horizontal layers of loose material not more than 8 inches in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction requirements for the upper portion of earth embankments forming subgrade for pavements shall be identical with those requirements specified in paragraph SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

### 3.9 SUBGRADE PREPARATION

#### 3.9.1 Construction

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Rock encountered in the cut section shall be excavated to a depth of 6 inches below finished grade for the subgrade. Low areas resulting from removal of unsatisfactory material or excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified. After rolling, the surface of the subgrade for roadways shall not show deviations greater than 1 inch when tested with a 10 foot straightedge applied both parallel and at right angles to the centerline of the area. The elevation of the finish subgrade shall not vary more than 0.05 foot from the established grade and cross section.

### 3.9.2 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Other areas beside pavement and trees shall be compacted to at least 95 percent of laboratory maximum density.

#### 3.9.2.1 Subgrade for Pavements

##### Percentage of Laboratory Maximum Density Required

Depth below Pavement (or Shoulder Surface) Inches		Fill		Cut	
From	To	Cohesive Materials	Cohesionless Materials	Cohesive Materials	Cohesionless Materials
1) 9"	15"	90	95	90	95
2) 21"	27"	90	95	90	95

- 1) Parking Lot
- 2) Rotery

Subgrade for pavements shall be compacted to at least 95 percentage laboratory maximum density for the depth below the surface of the pavement shown. When more than one soil classification is present in the subgrade, the top 6 inches of subgrade shall be scarified, windrowed, thoroughly blended, reshaped, and compacted.

#### 3.9.2.2 Subgrade for Shoulders

Subgrade for shoulders shall be compacted to at least 95 percentage laboratory maximum density for the full depth of the shoulder.

### 3.10 SHOULDER CONSTRUCTION

Shoulders shall be constructed of satisfactory excavated or borrow material or as otherwise shown or specified. Shoulders shall be constructed as soon as possible after adjacent paving is complete, but in the case of rigid pavements, shoulders shall not be constructed until permission of the Contracting Officer has been obtained. The entire shoulder area shall be compacted to at least the percentage of maximum density as specified in paragraph 3.9 SUBGRADE PREPARATION above, for specific ranges of depth below the surface of the shoulder. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Shoulder construction shall be done in proper sequence in such a manner that adjacent ditches will be drained effectively and that no damage of any kind is done to the adjacent completed pavement. The completed shoulders shall be true to

alignment and grade and shaped to drain in conformity with the cross section shown.

### 3.11 FINISHING

The surface of excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for graded areas shall be within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in paragraph 3.9 SUBGRADE PREPARATION. Gutters and ditches shall be finished in a manner that will result in effective drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials.

### 3.12 PLACING TOPSOIL

On areas to receive topsoil, the compacted subgrade soil shall be scarified to a 2 inch depth for bonding of topsoil with subsoil. Topsoil then shall be spread evenly to a thickness of 12 inches and graded to the elevations and slopes shown. Topsoil shall not be spread when frozen or excessively wet or dry. Material required for topsoil in excess of that produced by excavation within the grading limits shall be obtained from offsite areas.

### 3.13 TESTING

Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. If the Contractor elects to establish testing facilities, no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved by the Contracting Officer. Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2167, ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017; the calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. ASTM D 2937, Drive Cylinder Method shall be used only for soft, fine-grained, cohesive soils. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompacted to meet specification requirements. Tests on recompacted areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

### 3.13.1 Fill and Backfill Material Gradation

One test per 200 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM C 136, ASTM D 422, ASTM D 1140.

### 3.13.2 In-Place Densities

- a. One test per 1000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.
- b. One test per 1000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.
- c. One test per 100 linear feet, or fraction thereof, of each lift of embankment or backfill for roads.

### 3.13.3 Check Tests on In-Place Densities

If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 as follows:

- a. One check test per lift for each 2000 square feet, or fraction thereof, of each lift of fill or backfill compacted by other than hand-operated machines.
- b. One check test per lift for each 2000 square feet, of fill or backfill areas compacted by hand-operated machines.
- c. One check test per lift for each 100 linear feet, or fraction thereof, of embankment or backfill for roads.

### 3.13.4 Moisture Contents

In the stockpile, excavation, or borrow areas, a minimum of two tests per day per type of material or source of material being placed during stable weather conditions shall be performed. During unstable weather, tests shall be made as dictated by local conditions and approved by the Contracting Officer.

### 3.13.5 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 200 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

### 3.13.6 Tolerance Tests for Subgrades

Continuous checks on the degree of finish specified in paragraph 3.9 SUBGRADE PREPARATION shall be made during construction of the subgrades.

### 3.14 SUBGRADE AND EMBANKMENT PROTECTION

During construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the Contractor in a satisfactory condition until ballast, subbase, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted. No subbase, base course, ballast, or pavement shall be laid until the subgrade has been checked and approved, and in no case shall subbase, base, surfacing, pavement, or ballast be placed on a muddy, spongy, or frozen subgrade.

-- End of Section --

## SECTION 02316

EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS  
11/97

Item No. 13 - Bedding Material  
Item No. 14 - Select Granular Material

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTMC 33	1999a Standard Specification for Concrete Aggregate
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1996) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

## 1.2 DEGREE OF COMPACTION

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-09 Reports

Field Density Tests; G AE.

Testing of Backfill Materials; G AE.

Provide copies of all laboratory and field test reports within 24 hours of the completion of the test.

## PART 2 PRODUCTS

## 2.1 MATERIALS

## 2.1.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SP-SM.

## 2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 1 1/2 inches. The Contracting Officer shall be notified of any contaminated materials.

## 2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials shall include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials shall include materials classified as GC. Materials classified as GM and SM shall be identified as cohesionless only when the fines are nonplastic.

## 2.1.4 Unyielding Material

Unyielding material shall consist of rock and gravelly soils with stones greater than 1 1/2 inches in any dimension or as defined by the pipe manufacturer, whichever is smaller.

## 2.1.5 Unstable Material

Unstable material shall consist of materials too weak to properly support the utility pipe, conduit, or appurtenant structure.

## 2.1.6 Select Granular Material

Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall contain not more than 10 percent by weight of material passing a No. 200 mesh sieve and no less than 95 percent by weight passing the 1 inch sieve. The maximum allowable aggregate size shall be 1 1/2 inches, or the maximum size recommended by the pipe manufacturer, whichever

is smaller.

#### 2.1.7 Initial Backfill Material

Initial backfill shall consist of select granular material for areas outside the levee footprint and satisfactory materials free from rocks 1 1/2 inches or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller.

#### 2.1.8 Bedding Material

Bedding material shall consist of well-graded crushed stone meeting the requirements of ASTM C33, gradation 67 (3/4-in. to No.4).

#### 2.2 PLASTIC MARKING TAPE

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6 inches wide with minimum thickness of 0.004 inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in TABLE 1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 1. Tape Color

Red:	Electric
Yellow:	Gas, Oil, and Dangerous Materials
Orange:	Telephone, Telegraph, Television, Police, and Fire Communications
Blue:	Water Systems
Green:	Sewer Systems

### PART 3 EXECUTION

#### 3.1 EXCAVATION

Excavation shall be performed to the lines and grades indicated. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench equal to 1/2 the depth of the excavation, but in no instance closer than 2 feet. Excavated material not required or not satisfactory for backfill shall be removed from the site. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating shall be removed to maintain the stability of the bottom and sides of the excavation. Unauthorized over excavation shall be backfilled in accordance with paragraph BACKFILLING AND COMPACTION at no additional cost to the Government.

##### 3.1.1 Trench Excavation Requirements



The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below the top of the pipe shall be made vertical, and of such width as recommended in the manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls shall be made vertical. Trench walls more than 4 feet high shall be shored, cut back to a stable slope, or provided with equivalent means of protection for employees who may be exposed to moving ground or cave in. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. The trench width below the top of pipe shall not exceed 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter and shall not exceed 36 inches plus pipe outside diameter for sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by the Contractor without any additional cost to the Government.

#### 3.1.1.1 Bottom Preparation

For utilities which pass under the levee footprint, the bottom of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 1 1/2 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing. For utilities which pass outside the levee footprint, the trench shall be excavated to accommodate the depth of bedding material indicated.

#### 3.1.1.2 Removal of Unyielding Material

Where unyielding material is encountered in the bottom of the trench, such material shall be removed 4 inches below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.

#### 3.1.1.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material outside the levee footprint and satisfactory material below the levee as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the resulting material shall be excavated and replaced with select granular material by the Contractor without additional cost to the Government.

#### 3.1.1.4 Excavation for Appurtenances

Excavation for manholes, catch-basins, inlets, or similar structures shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members. Removal of

unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

#### 3.1.1.5 Jacking, Boring, and Tunneling

Unless otherwise indicated, excavation shall be by open cut except that sections of a trench may be jacked, bored, or tunneled if, in the opinion of the Contracting Officer, the pipe, cable, or duct can be safely and properly installed and backfill can be properly compacted in such sections.

#### 3.1.2 Stockpiles

Stockpiles of satisfactory and unsatisfactory materials shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed by rubber-tired equipment, excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government.

### 3.2 BACKFILLING AND COMPACTION

Backfill material shall consist of satisfactory material, select granular material, or initial backfill material as required. Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density for cohesionless soils and 90 percent maximum density for cohesive soils, unless otherwise specified.

#### 3.2.1 Trench Backfill

Trenches shall be backfilled to the grade shown. The trench shall be backfilled to 2 feet above the top of pipe prior to performing the required pressure tests. The joints and couplings shall be left uncovered during the pressure test. The trench shall not be backfilled until all specified tests are performed.

##### 3.2.1.1 Replacement of Unyielding Material

Unyielding material removed from the bottom of the trench shall be replaced with select granular material or initial backfill material.

##### 3.2.1.2 Replacement of Unstable Material

Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding

6 inches loose thickness.

#### 3.2.1.3 Bedding

Bedding will be provided for trenches outside the footprint of the levee. Bedding shall be of the type specified and thickness shown. The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. Bell holes and depressions for joints will be made in the bedding material and shall be only of such length, depth, and width as required for properly making the particular type of joint, so that the entire length of pipe is bearing upon and equally supported by the bedding material. The granular bedding shall have a thickness of 4 inches beneath all pipe and bell sections, and shall be extended halfway up the pipe barrel at the sides. Care shall be taken to ensure thorough compaction under the haunches of the pipe. For trenches under the footprint of the levee no bedding will be provided. The bedding surface for the pipe under the levee shall provide a firm foundation of uniform density throughout the entire length of the pipe. The pipe shall be bedded in an earth foundation formed in the trench bottom by a shaped excavation which will fit the pipe barrel for a width of at least 70% of the outside pipe diameter. Bell holes and depressions for joints will be made in the bedding surface and shall be only of such length, depth, and width as required for properly making the particular type of joint so that the entire length of pipe is bearing upon and uniformly supported by the bedding surface.

#### 3.2.1.4 Initial Backfill

Initial backfill material shall be placed and compacted with approved tampers to a height of at least one foot above the utility pipe or conduit.

The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe.

#### 3.2.1.3 Final Backfill

The remainder of the trench, except for special materials for roadways, railroads and airfields, shall be filled with satisfactory material. Backfill material shall be placed and compacted as follows:

- a. Roadways: Backfill shall be placed up to the elevation at which the requirements in Section 02300 EARTHWORK control. Water flooding or jetting methods of compaction will not be permitted.
- b. Levee: Backfill above initial backfill shall meet the requirements of section 02331 "Levee Construction".
- c. Sidewalks, Turfed or Seeded Areas and Miscellaneous Areas: Backfill shall be deposited in layers of a maximum of 12 inch loose thickness, and compacted to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Compaction by water flooding or jetting will not be permitted. This requirement shall also apply to all other areas not specifically designated above.

### 3.2.2 Backfill for Appurtenances

After the manhole, catch basin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for 5 days, backfill shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be brought up evenly on all sides of the structure to prevent eccentric loading and excessive stress.

### 3.3 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

#### 3.3.1 Water Lines

Trenches shall be of a depth to provide a minimum cover of 4 feet from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe.

#### 3.3.2 Electrical Distribution System

Direct burial cable and conduit or duct line shall have a minimum cover of 24 inch from the finished grade, unless otherwise indicated.

#### 3.3.3 Plastic Marking Tape

Warning tapes shall be installed directly above the pipe, at a depth of 18 inches below finished grade unless otherwise shown.

### 3.4 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government.

#### 3.4.1 Testing Facilities

Tests shall be performed by an approved commercial testing laboratory or may be tested by facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been inspected and approved by the Contracting Officer. The first inspection shall be at the expense of the Government. Cost incurred for any subsequent inspection required because of failure of the first inspection will be charged to the Contractor.

#### 3.4.2 Testing of Backfill Materials

Classification of backfill materials shall be determined in accordance with ASTM D 2487 and the moisture-density relations of soils shall be determined in accordance with ASTM D 1557. A minimum of one soil classification and one moisture-density relation test shall be performed on each different type of material used for bedding and backfill.

### 3.4.3 Field Density Tests

Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. A minimum of one field density test per lift of backfill for every 100 feet of installation shall be performed. One moisture density relationship shall be determined for every 1500 cubic yards of material used. Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using the sand cone method as described in paragraph Calibration of the ASTM publication. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job, on each different type of material encountered, and at intervals as directed by the Contracting Officer. Copies of calibration curves, results of calibration tests, and field and laboratory density tests shall be furnished to the Contracting Officer. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the Government.

### 3.4.4 Displacement of Sewers

After other required tests have been performed and the trench backfill compacted to 2 feet above the top of the pipe, the pipe shall be inspected to determine whether significant displacement has occurred. This inspection shall be conducted in the presence of the Contracting Officer. Pipe sizes larger than 36 inches shall be entered and examined, while smaller diameter pipe shall be inspected by shining a light or laser between manholes or manhole locations, or by the use of television cameras passed through the pipe. If, in the judgement of the Contracting Officer, the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, the defects shall be remedied as directed at no additional cost to the Government.

-- End of Section --

02331

LEVEE CONSTRUCTION  
08/99

Item No. 5 - Excavation, Common  
Item No. 6 - Excavation, Stripping  
Item No. 8 - Compacted Embankment Material

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M 43 (1988; R 1995) Sizes of Aggregate for Road and Bridge Construction

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33 (1999) Concrete Aggregates

ASTM D 422 (1963; R 1998) Particle-Size Analysis of Soils

ASTM D 698 (1991; R 1998) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))

ASTM D 1556 (1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method

ASTM D 2167 (1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method

ASTM D 2216 (1998) Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 2487 (1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D 2922 (1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

ASTM D 2937	(1994) Density of Soil in Place by the Drive-Cylinder Method
ASTM D 3017	(1996) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4253	(1993; R 1996) Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D 4254	(1991; R 1996) Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D 4318	(1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 4643	(1993) Determination of Water (Moisture) Content of Soil by the Microwave Oven Method
ASTM D 5195	(1991; R 1996) Density of Soil and Rock In-Place Below the Surface by Nuclear Methods

#### ENGINEERING MANUALS (EM)

EM 385-1-1	(1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual
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### 1.2 SYSTEM DESCRIPTION

The work covered by this section consists of furnishing all equipment, labor, materials, and incidentals, and performing all operations necessary for the clearing, grubbing, and stripping of the areas specified herein or indicated on the drawings, and for the removal and disposal of cleared, grubbed, and stripped materials, and refilling of holes resulting from grubbing; excavation of borrow areas and for all other excavations incidental to the construction of levees, channels, ditches, structures, and ponding areas as specified and shown; foundation preparation and the construction of levee embankments, including new levee, enlargement of existing levee, backfill of inspection trenches, cutoff trenches, berms, road crossings, backfill at drainage structures, and other incidental earthwork as may be necessary to complete the levee as specified herein and as shown on the drawings. All work under this section shall comply with the requirements of EM 385-1-1.

### 1.3 DEFINITIONS

#### 1.3.1 Clearing

Clearing shall consist of the removal and satisfactory disposal of all above ground and below ground trees, downed timber, snags, slash, brush, garbage, trash, debris, fencing, and other items occurring in the

designated areas to be cleared.

#### 1.3.2 Grubbing

Grubbing shall consist of the removal and satisfactory disposal of stumps, roots larger than 6 inches in diameter, and matted roots from the designated grubbing areas. Grubbing also includes filling of holes from the grubbing operation.

#### 1.3.3 Stripping

Stripping shall consist of the removal and satisfactory disposal of crops, weeds, grass, and other vegetative materials to the ground surface and topsoil to a depth of 12 inches.

#### 1.3.4 Satisfactory Materials

Satisfactory materials shall consist of materials classified in accordance with ASTM D 2487 as SM, SM-SC, SC, CL, CL-ML, ML, SP, SW, free from: roots and other organic matter; contamination from hazardous, toxic or radiological substances; trash, debris; and frozen materials. Not all satisfactory materials can be used in levee. Only the satisfactory materials stated above, meeting the additional or modified requirements of paragraph TYPES OF FILL MATERIALS, can be used for levee construction.

#### 1.3.5 Unsatisfactory Materials

Unsatisfactory materials shall not be used in any levee or other required fill. Unsatisfactory materials includes all other materials that are not defined above as satisfactory materials.

#### 1.3.6 Embankment

The terms "levee" or "embankment" as used in these specifications are defined as the earth fill portions of the levee structure or other fills related to the levee structure, and includes all types of earth fill for the levee and inspection trench, and all other fills within the limits of the levee.

#### 1.3.7 Backfill

Backfill as used in this section is defined as that fill material which cannot be placed around or adjacent to a structure until the structure is completed or until a specified time interval has elapsed after completion.

#### 1.3.8 Excavation

Excavation shall consist of removal of material to the lines and grades shown on the drawings, or as otherwise directed or approved by the Contracting Officer and as described in paragraph 3.8 EXCAVATION in PART 3 EXECUTION.

#### 1.3.9 Classification of Soils



Materials used to construct the embankments and for backfills shall be classified in accordance with ASTM D 2487 (Unified Soil Classification System).

#### 1.3.9.1 Cohesionless and Cohesive Materials

Cohesionless materials shall include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.

#### 1.3.10 Degree of Compaction

##### 1.3.10.1 Cohesive Material

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 698 abbreviated hereinafter as percent laboratory maximum density.

##### 1.3.10.2 Cohesionless Material

Degree of compaction shall be expressed as a percentage of the relative density in accordance with ASTM D 4253 and ASTM D 4254.

#### 1.4 GENERAL CONDITIONS

##### 1.4.1 Lines and Grades

The embankment and backfill shall be constructed to the lines, grades, and cross sections indicated on the drawings, unless otherwise directed by the Contracting Officer. The Government reserves the right to increase or decrease the foundation widths and embankment slopes or to make such other changes in the embankment or backfill sections as may be deemed necessary to produce a safe structure. Changes in quantities resulting from such revisions will not constitute justification for change in contract unit prices, except as provided for in the Variations in Estimated Quantities Clause. Increases in height of section, made to compensate for settlement or consolidation of the embankment material subsequent to the completion of the embankment, will not exceed 20 percent of the height above the foundation at the levee centerline indicated. The end slopes and side slopes of partial fill sections shall not be steeper than one vertical on 2.5 horizontal.

##### 1.4.2 Conduct of the Work

The Contractor shall maintain and protect the embankment and backfill in a satisfactory condition at all times until final completion and acceptance of all work under the Contract. If, in the opinion of the Contracting Officer, the hauling equipment causes horizontal shear planes or slicken sides, rutting, quaking, heaving, cracking, or excessive deformation of the embankment or backfill, the Contractor shall limit the type, load, or travel speed of the hauling equipment on the embankment or backfill. The Contractor may be required to remove, at his own expense, any embankment material placed outside of prescribed slope lines. Any approved embankment

or backfill material which is lost in transit or rendered unsuitable after being placed in the embankment or backfill and before final acceptance of the work shall be replaced by the Contractor in a satisfactory manner and no additional payment will be made therefor. The Contractor shall excavate and remove from the embankment or backfill any material which is unsatisfactory and shall also dispose of such material and refill the excavated area as directed, all at no cost to the Government.

#### 1.4.3 Materials

Materials for embankment and backfill construction will be obtained from sources provided by the Contractor and required excavation. Materials obtained from required excavation which meet or which can be processed to meet the requirements for each embankment material, or any other material required for this project, as specified herein, may be utilized in the embankment or as backfill. All roots, limbs, and wood fragments shall be removed from embankment materials. Materials containing sod, other organic or perishable material, trash, debris, and frozen materials shall not be used in the embankment. The Contractor shall submit to the Contracting Officer the source or sources from which he intends to obtain materials for embankment construction. If a source is selected other than a commercial quarry or other commercial entity from which earth or rock material will be directly purchased and where the Contractor or his subcontractor will perform the borrow excavation, a written statement will be provided to the Contracting Officer indicating permission to utilize the area. It shall be the responsibility of the Contractor to obtain Federal, State, and local permits which may be required for excavation and reclamation of the borrow area. A copy of the plan and procedures to be utilized for reclamation shall be furnished to the Contracting Officer as required. The Contracting Officer will require material samples from any proposed borrow source to be submitted as indicated in paragraph Quality Control.

#### 1.4.4 Stockpiling

Any on-site stockpiling of embankment materials shall be in accordance with paragraph 3.11 Stockpiles.

#### 1.4.5 Slides and Foundation Failures

When sliding occurs in any part of the embankment and backfills prescribed in this section after they have been placed, but prior to final acceptance of all work under the contract, the Contractor shall repair the slide as directed by the Contracting Officer. When the slide is caused through the fault of the Contractor, the repair shall be made at no cost to the Government. When the slide is not the fault of the Contractor, an equitable adjustment in the contract price shall be made pursuant to the Contract Clause CHANGES to cover the cost of the repairs.

#### 1.4.6 Protection of Existing Man-Made Facilities and Natural Features

Embankment construction shall be conducted in such a manner as to avoid damage to trees left standing and trees outside the embankment areas, existing buildings, man-made facilities and natural features, with due regard to the safety of employees and others, and in compliance with EM

385-1-1.

#### 1.4.7 Drainage

The Contractor shall not block or restrict the flow in a natural drain, existing culvert, ditch or channel at any time without obtaining prior written approval from the Contracting Officer. This approval shall not relieve the Contractor from responsibility for any damage caused by his operation. The Contractor shall monitor the river flow and provide sufficient free discharge areas so that conditions are not worsened upstream or downstream by possible floods during construction. Surface water shall be directed away from excavations and construction sites so as to prevent erosion and undermining of foundations. Diversion ditches, dikes, and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site and the area immediately surrounding the site and affecting operations at the site shall be continually and effectively drained.

#### 1.5 SUBMITTALS

Government approval is required for all submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

##### SD-01 Data

Compacted Fill, Common and Compacted Embankment Fill.

Submit data for compacted fill, common and compacted embankment fill.

##### SD-08 Statements

Shoring, Sheet piling, and Bracing; G AE.

Submit a detailed shoring, sheet piling and bracing plan 30 days prior to the beginning of any excavation so supported. The plan for shoring, sheet piling and bracing shall be prepared and certified by licensed professional engineer. The plan shall include drawings and design computations of the proposed shoring, sheet piling, and bracing, and documentation, showing details of the coordination and approval of shoring, sheet piling, and bracing by the applicable parties. Approval of the detailed plan shall be obtained from the Contracting Officer prior to starting the work. If necessary, the plan shall be modified as required to meet field conditions, and the modifications shall be approved prior to use.

Excavation; G AE.

Submit a written excavation plan 30 days prior to the beginning of any excavation. Approval of the detailed plan shall be obtained from the Contracting Officer prior to starting the work. If necessary, the plan shall be modified as required to meet field conditions, and the modifications shall be approved prior to use. As a minimum, the plan shall contain, the following:

- a. Proposed methods for preventing interference with, or damage to, existing underground or overhead utility lines, trees designated to remain and other man-made facilities or natural features designated to remain within or adjacent to the construction rights-of-way.
- b. Provision for coordinating the work with other Contractors working in the construction rights-of-way or on facilities crossing or adjacent to this work.
- c. The proposed methods for controlling surface and ground water in the borrow areas and required excavations.
- d. Stockpiling plan for embankment material before it is transported to the project site showing locations, stockpile heights, slopes, limits, and drainage around the stockpile areas.
- e. A complete listing of equipment used for excavation and to transport the excavated material.
- f. The Contractor's proposed sequence of work for excavating the borrow areas with plan and cross sectional views showing starting and final work locations and clearing, grubbing and stripping limits.
- g. The Contractor's proposals for conserving arable land and for making optimum use of available borrow, including the Contractor's proposed methods for grading the bottom of the borrow areas after completing use of the borrow areas.
- h. The Contractor's proposed road pattern, and plan for implementing dust control measures.

Borrow Areas; G AE.

Submit a written statement to the Government not later than 30 days after receipt of Notice to Proceed indicating the Contractor's intention to use the specified Government-furnished borrow area(s), Contractor-furnished borrow area(s), dredged borrow areas, or a combination of these borrow areas.

Plan of Operations; G AE.

Thirty (30) days prior to commencement of haul road construction or placing embankment and backfill which ever is earlier, the contractor shall submit for approval a Plan of Operations for accomplishing all embankment and backfill construction and for the location and construction of haul roads. This plan shall include but not be limited to the Contractor's proposed sequence of construction for embankment and backfill items, and methods and types of equipment to be utilized for all embankment and backfill operations, including transporting, placing, and compaction. This plan shall also include the names and addresses of the commercial testing labs which will perform the soil testing and inspection and describe how all required soils testing will be performed.

Embankment and Backfill Materials; G AE.

At least 30 days prior to delivery of any Contractor-furnished material to the site of the work, the Contractor shall submit soil classification test results, moisture-density curves, gradation curves, and laboratory results of the required tests of the proposed material.

Nuclear Density Testing Equipment Operator; G AE.

Nuclear density testing equipment shall be used in accordance with ASTM D 2922 and ASTM D 3017. In addition, the following condition shall apply:

- a. Prior to using the nuclear density testing equipment on the site, the Contractor shall submit to the Contracting Officer a certification that the operator has completed a training course approved by the nuclear density testing equipment manufacturer, the most recent data sheet from the manufacturer's calibration, and a copy of the most recent statistical check of the standard count precision.
- b. The nuclear density testing equipment shall be capable of extending a probe a minimum of 6 inches down into a hole.

SD-09 Reports

Survey Records; G AE.

Submit a copy of the records of each compliance survey the next work day following the survey.

SD-18 Records

Contractor-Furnished Rights-of-way for Drainage.

If private property is to be used for drainage, submit written evidence that the right has been obtained from the property owner for drainage on his property. Written evidence shall consist of an authenticated copy of the conveyance or easement under which the Contractor acquired the property rights and access thereto, prepared and executed in accordance with applicable State and local requirements.

## 1.6 REGULATORY REQUIREMENTS

The state statutory and regulatory requirements listed below form a part of this specification to the extent referenced. NJDOT Standard Specification.

## 1.7 PERMITS

In accordance with Contract Clause PERMITS AND RESPONSIBILITIES, the Contractor shall obtain all necessary permits required for disposal, hauling, erosion control, burning, and pay all fees associated with permitting and compliance. The Contractor shall comply with the terms of these permits and with the requirements of Sections 01354 ENVIRONMENTAL PROTECTION FOR CIVIL WORKS, Section 01356 STORM WATER POLLUTION PREVENTION MEASURES, and this section.

## 1.8 PROJECT SITE CONDITIONS

### 1.8.1 Protection of Cultural and Natural Resources

All work and Contractor operations shall comply with the requirements of Section 01354 ENVIRONMENTAL PROTECTION FOR CIVIL WORKS and with the requirements of this section.

### 1.8.2 Protection of Existing Man-Made Facilities and Natural Features

Trees within the clearing area shall be felled in such a manner as to avoid damage to trees left standing and trees outside the clearing area, existing buildings, man-made facilities and natural features, with due regard to the safety of employees and others, and in compliance with EM 385-1-1.

Excavation shall be conducted in such a manner as to avoid damage to trees left standing and trees outside the clearing and excavation area, existing buildings, man-made facilities and natural features, with due regard to the safety of employees and others, and in compliance with EM 385-1-1.

Existing utility lines that are shown on the drawings or the locations of which are made known to the Contractor prior to excavation and that are to be retained shall be protected from damage during excavation. When utility lines that are to be removed are encountered within the area of operations, the Contractor shall notify the applicable utility companies in sufficient time for measures to be taken to prevent interruption of the services.

### 1.8.3 Historical, Archeological, and Cultural Resources

Historical, archeological, and cultural resources within the Contractor's work limits may exist. If, during construction activities, the Contractor observes items that may have historical or archeological value, such observations shall be reported immediately to the Contracting Officer so that appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in the destruction of these resources and shall prevent his employees from trespassing on or otherwise damaging such resources.

### 1.8.4 Subsurface Data

Subsurface soil boring logs are shown on the drawings. Subsurface investigation reports and samples of materials obtained from subsurface investigations may be examined at the Caven Point Marine Terminal, Soil Warehouse, Foot of Chapel Avenue, Jersey City, NJ. These data represent subsurface information at the boring locations; however, variations may exist in the subsurface between boring locations. Groundwater levels indicated on the soil boring logs were levels found at the time of exploration. The groundwater table can vary significantly depending on time of year, variation from normal precipitation, and river stage or tide level.

## 1.9 SEQUENCE OF WORK

### 1.9.1 Clearing and Grubbing

All clearing and grubbing work shall be completed at least 300 feet in advance of embankment construction. In locations where work on drainage structures is performed prior to embankment construction, all clearing and grubbing shall be completed for the structure at least 5 feet on each side of the structure, measured along the levee centerline and 3 feet perpendicular to the structure. If regrowth of vegetation or trees occurs after clearing and grubbing and before placement of embankment, the Contractor will be required to clear and grub again prior to embankment construction.

#### 1.9.2 Stripping

After inspection and acceptance of cleared and grubbed areas, stripping may proceed. All stripping work shall be completed not more than 100 feet in advance of embankment construction.

### PART 2 PRODUCTS

#### 2.1 TYPES OF FILL MATERIALS

##### 2.1.1 Compacted Embankment Fill

This material shall consist of satisfactory compacted embankment material classified as lean clay (CL), low plasticity silt (ML), (SM-ML), SC sand containing more than 30 percent of clay (CL), and borderline clay and silt (CL-ML) in accordance with ASTM D 2487.

##### 2.1.2 Compacted Fill Common

Compacted fill common shall consist of any satisfactory materials as a SM, SP, SW, ML and any silt or sand with a uniformity coefficient (Cu) less than 6.

##### 2.1.3 Bedding

Bedding material, placed as a backing layer shall consist of satisfactory pervious fill material satisfying the material requirements presented in Section 02380 STONE PROTECTION FOR STRUCTURES.

##### 2.1.4 Topsoil

Topsoil consists of organic soil and shall be placed on the levee slopes as shown on the contract drawings.

### PART 3 EXECUTION

#### 3.1 GRUBBING

Grubbing shall be accomplished within the limits of existing ground to receive embankment and structures, together with strips 5 feet wide, beyond and contiguous thereto, existing levees to be degraded, ponding areas, ditches, structures, traverses, channels, riprap, revetment, borrow areas and ramps. Grubbing shall be accomplished to a depth of at least 3 feet

below the existing ground surface.

#### 3.1.1 Filling of Holes

All holes caused by grubbing operations and removal of pipes and drains, excluding holes in borrow areas, channels and ditches above required grade, shall be filled with satisfactory material as specified in paragraph 1.3.4.

This material shall be placed in inch layers to the elevation of the adjacent ground surface and each layer compacted to a density at least equal to that of the adjoining undisturbed material.

#### 3.2 STRIPPING

The entire area within the limits of existing ground to receive embankment and structures, together with strips 5 feet wide, beyond and contiguous thereto, existing levees to be degraded, ponding areas, and ditches shown on the drawing shall be stripped to remove crops, weeds, grass, and other vegetative materials to the ground surface and topsoil to a depth of 12 inches.

#### 3.3 DISPOSITION OF CLEARED, GRUBBED, AND STRIPPED MATERIAL

Except as otherwise specified or indicated on the drawings, all materials resulting from clearing and grubbing operations shall, at the Contractor's option, be disposed of either by windrowing or stockpiling within construction limits, burying within construction limits, burning, chipping, removal from the site, or a combination thereof. In no case shall any material resulting from clearing and grubbing operations be buried or permanently placed within the levee foundation or any structural foundation. The Contractor shall make a reasonable effort to channel merchantable material into the commercial market and to make beneficial use of the materials resulting from clearing and grubbing. The topsoil material resulting from the stripping operations shall be temporarily stockpiled within the rights-of-way.

##### 3.3.1 Chipping

All cut timber, down timber, dead timber, branches, and brush may be chipped. The chips shall be hauled either to stockpiles indicated on the drawings or to other locations approved by the Contracting Officer or removed from site of work.

##### 3.3.2 Removal from Site of Work

The Contractor may elect to remove all or part of the cleared and grubbed materials from the site of the work in accordance with Section 01354 ENVIRONMENTAL PROTECTION FOR CIVIL WORKS. The Contractor shall, at his option, either retain any such materials of value for his own use or dispose of them by sale or otherwise. The Government is not responsible for the protection and safekeeping of any materials retained by the Contractor. Such materials shall be removed from the site of the work before the date of completion of the work.

#### 3.4 REMOVAL OR PLUGGING OF ABANDONED PIPE AND CONDUITS



Abandoned pipes and conduits shall be removed to the limits shown on the drawings or plugged with concrete a minimum distance of 5 feet beyond the toe of levee in each direction. Prior to plugging, the Contractor shall clean the interior of the pipe to be plugged and place the concrete in such a manner as to insure a dense, well bonded plug.

### 3.5 SHORING, SHEETING, AND BRACING

Shoring, sheeting, and bracing shall be installed where required for the protection of existing natural features and man-made facilities, for the safety of workers and the public, in compliance with EM 385-1-1, and to insure the integrity of the embankment. Shoring, sheeting and bracing shall not be used in lieu of the required excavation slopes. Shoring, sheeting, and bracing shall be adequately designed and properly installed to withstand anticipated loads. Shoring, sheeting and bracing shall be planned and designed by a registered professional engineer. The Contractor shall submit a plan for shoring, sheeting, and bracing in accordance with paragraph SUBMITTALS. All shoring, sheeting and bracing shall be removed as embankment and backfill operations progress.

### 3.6 DEWATERING AND DIVERSION

Surface and groundwater control shall be accomplished in coordination with the required excavation and embankment construction. Surface and/or groundwater control may necessitate the use of temporary diversion ditches, cofferdams and/or dewatering by the use of pumping. Methods for care of surface water and for controlling the surface and groundwater levels shall be subject to approval of the Contracting Officer.

### 3.7 EXCAVATION

Excavation shall consist of removal of material in preparing the foundations to the lines and grades shown on the drawings, removal of material from ditches and channels to the lines and grades shown on the drawings, removal of objectionable materials and obtaining required fill materials from the borrow areas. Blasting will not be permitted. Over excavation shall be backfilled to grade with similar over excavated material or satisfactory material and compacted to a density of at least that of the surrounding material.

#### 3.7.1 Over Excavation

##### 3.7.1.1 Outside Limits of Levee Foundations or Structures

Over excavation outside the limits of the foundations of levees or structures shall be backfilled to grade with similar over excavated material or satisfactory material and compacted to a density of at least that of the surrounding material.

##### 3.7.1.2 Within Limits of Levee Foundations or Structures

Over excavation within the limits of the foundations of levees or structures shall be backfilled to grade in accordance with paragraph 3.15

## PREPARATION OF FOUNDATION, PARTIAL FILL SURFACES AND ABUTMENTS.

## 3.7.2 Inspection Trench

An inspection trench shall be excavated and maintained free of standing water to the dimensions and locations shown on the drawings. The trench shall be excavated at least 25 feet in advance of but not more than 5 feet in advance of construction.

## 3.7.3 Structures

Excavations for structures shall conform to the dimensions and elevations indicated for each structure and footing, except as specified hereinafter, and shall include trenching for utility and foundation drainage systems to a point 5 feet beyond each structure and all work incidental thereto. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms. Satisfactory material removed below the depths indicated without specific direction of the Contracting Officer shall be replaced at no additional cost to the Government and filled in accordance with paragraph 3.7.1 OVER EXCAVATION above. Over excavation below required invert elevations or bottoms of footings shall be backfilled with lean concrete at no additional cost to the Government. No footings shall be constructed on unsatisfactory material as determined by the Contracting Officer. Excessively wet and/or soft material in subgrades resulting from water ponding in footing excavations shall be removed and replaced with lean concrete or satisfactory material compacted to the density of the surrounding undisturbed material.

## 3.7.4 Channels

Channels shall be excavated at the locations and to the lines and grades shown on the drawings and in accordance with paragraph TOLERANCES.

## 3.7.5 Ditches

Drainage ditches shall be excavated at the locations and to the lines and grades shown on the drawings and in accordance with paragraph TOLERANCES.

## 3.7.6 Slopes and Surcharges

Temporary excavation slopes for any channel, structure excavation, or other required excavation shall not be steeper than the specified finished slope or the specified construction slope, as applicable, and subject to the approval of the Contracting Officer. This may be accomplished by benching the temporary slope so that the average slope is not steeper than the specified slope. In addition, no temporary, permanent, or construction slope shall be surcharged with excavated or stockpiled material or with heavy construction equipment which would have the same effect as the surcharge material. The toe of stockpiled material shall be maintained a minimum distance back from the top of the finished excavation equal to the depth of the excavation. The maximum height of such stockpile without causing instability of the excavation slope shall be determined by the Contractor. Any slide or other adverse conditions caused by failure of the Contractor to maintain these conditions shall be considered the

responsibility of the Contractor and remedial measures shall be at the Contractor's expense.

### 3.7.7 Borrow Areas

#### 3.7.7.1 Contractor-Furnished

Borrow areas proposed by the Contractor shall be subject to approval by the Contracting Officer. Any borrow sources proposed, accepted and approved by the Contracting Officer shall meet all applicable Federal, State and local requirements. No payment will be made for Contractor-furnished borrow areas.

### 3.7.8 Utilities

Excavations for pipe beds shall be shaped to fit the contour of the pipe over a width of not less than 0.6 of the pipe diameter, or as shown on the drawings.

### 3.7.9 Rock

Rock and other hard foundation materials shall be cleaned of loose debris and cut to a firm surface, either level, stepped, or serrated, as shown on the drawings. Loose disintegrated rock and thin strata shall be removed. Rock excavation will not be measured for payment. Rock excavation will not be paid for as a separate bid item.

#### 3.7.10 Crushed Stone

Excavations for crushed stone shall be performed at the locations and to the lines and grades shown.

### 3.8 TOLERANCES

A tolerance of 2 inches above or below the prescribed grade will be allowed in the excavation for channels, ditches, inspection trenches, cutoff trenches, excavations for riprap and bedding, and mandatory borrow areas. A tolerance of 2 inches below the prescribed grade will be allowed in the excavation for all other borrow areas.

All embankments and backfills shall be constructed to the grades, lines, and cross-sections shown on the drawings. At all points a tolerance of 4 inches above or below the prescribed grade will be permitted in the final dressing, provided that any excess material is so distributed that the crown of the levee drains and that there are no abrupt humps or depressions in any surfaces. For topsoil, a tolerance of 2 inches above the thickness as shown on the drawings will be permitted.

### 3.9 SLIDES

In case sliding occurs in any part of the excavations prescribed in this section after they have been excavated, but prior to final acceptance of all work under the contract, the Contractor shall repair the slide as directed by the Contracting Officer. In case the slide is caused through the fault of the Contractor, it shall be repaired at no cost to the

Government. In case the slide is due to no fault of the Contractor, an equitable adjustment in the contract price will be made for the repairs in accordance with the Contract Clause CHANGES.

### 3.10 TRAVERSES

Traverses shall be left unexcavated between borrow areas at the locations shown on the drawings.

### 3.11 STOCKPILES

Provisions of paragraph SLOPES AND SURCHARGES are applicable to all stockpiled materials. Upon completion of construction operations, all remaining stockpiled material shall be removed and disposed of by the disposal methods specified in paragraph 3.14 DISPOSITION OF EXCAVATED MATERIALS.

### 3.12 SURFACE DRAINAGE OF COMPLETED AREAS

The areas shown on the drawings designated as "GRADE FOR SURFACE DRAINAGE", the borrow areas, and the finished embankment areas shall be graded to the lines and grades shown on the drawings. The surface shall be free from sharp ridges, gullies, potholes, sinkholes, and any other surface irregularities. A tolerance of 2 inches above or below the prescribed grade will be allowed provided that the surface drains in the direction as indicated on the drawings.

### 3.13 MAINTENANCE OF WORK

#### 3.13.1 Debris Removal

The Contractor shall maintain all ditch and channel excavations free from leaves, brush, sticks, trash, and other debris until final acceptance of all work under the contract at no additional cost to the Government.

#### 3.13.2 Sediment Removal

Prior to final acceptance of all work under this contract, the removal of sediments from ditch or channel excavations shall be required to restore design grade and section at no additional cost to the Government.

### 3.14 DISPOSITION OF EXCAVATED MATERIALS

#### 3.14.1 Satisfactory Materials

Satisfactory excavated material shall be incorporated in the appropriate zones of the embankment. Satisfactory material shall consist of material as defined in paragraph 1.3 DEFINITIONS, subparagraph 1.3.4 SATISFACTORY MATERIALS. When direct placement is not practicable, satisfactory material from the excavation shall be stockpiled for subsequent use in parts of the work for which it is specified herein and/or as indicated on the drawings. Satisfactory materials in excess of the quantity necessary to construct backfills and embankments shall be disposed of as specified for unsatisfactory materials.

### 3.14.2 Unsatisfactory Materials

Unsatisfactory materials shall be as defined in paragraph 1.3 DEFINITIONS, subparagraph 1.3.5 UNSATISFACTORY MATERIALS. Unsatisfactory materials from the excavations prescribed in this section shall be permanently disposed of by removal from the site to a Contractor-furnished disposal area. No additional payment will be made for Contractor-furnished disposal areas.

## 3.15 PREPARATION OF FOUNDATION, PARTIAL FILL SURFACES AND ABUTMENTS

### 3.15.1 Earth

After excavation (as described in paragraph 3.7 EXCAVATION or stripping (as described in paragraph 3.2 STRIPPING of the embankment foundation and excavation of the inspection trench to the extent indicated or otherwise required, the sides of stump holes, test pits, and other similar cavities or depressions shall be broken down so as to flatten out the slopes, and the sides of the cut or hole shall be scarified to provide bond between the foundation material and the fill. The slopes and bottom of the inspection trench shall be scarified, as directed. Unless otherwise directed, each depression shall be filled with the same material type that is to be placed immediately above the foundation. The fill shall be placed in layers, moistened, and compacted in accordance with the applicable provisions of paragraphs 3.16 PLACEMENT, 3.17 MOISTURE CONTROL, and 3.18 COMPACTION for the specific material type. Materials which cannot be compacted by roller equipment because of inadequate clearances shall be compacted with power tampers in accordance with the paragraph COMPACTION for the specific material type. After filling of depressions and immediately prior to placement of compacted fill in any section of the embankment, the foundation of such section shall be loosened thoroughly by scarifying, plowing, discing or harrowing to a minimum depth of 12 inches, and the moisture content shall be adjusted to the amount specified in paragraph 3.17 MOISTURE CONTROL for the appropriate type of material. After removal of roots or other debris turned up in the process of loosening, the entire surface of the embankment foundation area shall be compacted by 4 complete coverages of the compaction equipment as specified for the appropriate type of fill. Immediately prior to placement of compacted fill on or against the surfaces of any partial fill section, all soft or loose material, all material containing cracks or gullies, and all material that does not conform with the specified zoning of the embankment shall be removed. The remaining surface of the partial fill shall be loosened by scarifying, plowing, discing or harrowing to a minimum depth of 6 inches, and the moisture content shall be adjusted as specified in paragraph 3.17 MOISTURE CONTROL for the appropriate type of material. The surface of the partial fill section upon which fill is to be placed shall then be compacted as hereinafter specified for the appropriate type of fill. No separate payment will be made for loosening and rolling the foundation area, the abutment area, or the surfaces of partial fill sections, but the entire cost thereof shall be included in the applicable contract price for fill.

## 3.16 PLACEMENT AND SPREADING

### 3.16.1 General

Prior to beginning embankment placement on the levee foundation the Contractor shall notify the Government that the foundation is ready to receive fill. No fill shall be placed on any part of the embankment foundation until such areas have been inspected and given final approval by the Contracting Officer.

#### 3.16.1.1 Gradation and Distribution

The gradation and distribution of materials throughout each zone of the levee shall be such that the embankment will be free from lenses, pockets, streaks, and layers of material differing substantially in texture or gradation from surrounding material of the same class. If lenses, pockets, or layers of materials differing substantially in texture or gradation from surrounding material occur in the spread material, the layer shall be mixed by harrowing or any other approved method to blend the materials. During the placing and spreading process, the Contractor shall maintain at all times a force of workers adequate to remove all roots, debris, and oversize stone from all embankment materials. All stones and rock fragments larger than 3 inches in any dimension shall be removed from the fill. No fill shall be placed upon a frozen surface, nor shall snow, ice, or frozen earth be incorporated in the embankment. Embankment fill shall be placed in layer thickness of 12 inches.

#### 3.16.1.2 Foundations

The foundations receiving fills shall be kept thoroughly drained. Placing operations will be such as to avoid mixing of materials from adjacent sections as much as practicable.

#### 3.16.1.3 Equipment Traffic

Equipment traffic on any embankment zone shall be routed to distribute the compactive effort as much as practicable. Ruts formed in the surface of any layer of spread material will be filled before that material is compacted. If, in the opinion of the Contracting officer, the compacted surface of any layer of material is too smooth to bond properly with the succeeding layer, the surface shall be loosened by scarifying or other approved methods before material from the succeeding layer is placed.

#### 3.16.2 Placement on Surfaces Containing Frozen Materials

Embankment shall not be placed on a foundation which contains frozen material. This prohibition encompasses all foundation types, including the natural ground, all prepared subgrades (whether in an excavation or on an embankment, and all layers of previously placed and compacted earth fill which become the foundations for successive layers of earth fill. All material that freezes or has been subjected to freeze-thaw action during the construction work, or during periods of temporary shutdowns, such as, but not limited to nights, holidays, weekends, or winter shutdowns of earthwork operations, shall be removed to a depth that is acceptable to the Contracting Officer and replaced with new material. Alternatively, the material shall be thawed, dried, reworked and recompacted to the specified criteria before additional material is placed. The Contracting Officer

will determine when placement of fill shall cease due to cold weather. The Contracting Officer may elect to use average daily air temperatures, and/or physical observation of the soils for the determination. Levee embankment material shall not contain frozen clumps of soil, snow or ice.

### 3.16.3 Placement of Embankment and Backfill Against Structures

No embankment or backfill shall be placed on or against concrete less than 7 days after placement or 70 percent of the design strength, without prior approval of the Contracting Officer. Crawler-type tractors, vibratory equipment and other similar compaction equipment shall not be used within 5 feet of any completed or partially completed structure. Compaction within 5 feet of completed or partially completed structures shall be accomplished by the use of mechanical hand tampers, vibrating plates, or other approved methods and equipment. The Contractor shall ensure that compaction operations do not damage any existing utilities. Any damage caused by the Contractor's operation shall be repaired at the Contractor's expense.

## 3.17 MOISTURE CONTROL

### 3.17.1 General

The materials in each layer of the fill shall contain the amount of moisture, within the limits specified below or as directed by the Contracting Officer, necessary to obtain the required compaction. Material that is not within the specified moisture content limits after compaction shall be reworked to obtain the specified moisture content, regardless of density.

#### 3.17.1.1 Insufficient Moisture for Suitable Bond

If the top or contact surfaces of a partial fill section become too dry to permit suitable bond between these surfaces and the additional fill to be placed thereon, the Contractor shall loosen the dried materials by scarifying or discing to such depths as may be directed by the Contracting Officer, shall dampen the loosened material to an acceptable moisture content, and shall compact this layer in accordance with the applicable requirements of paragraph COMPACTION.

#### 3.17.1.2 Excessive Moisture for Suitable Bond

If the top or contact surfaces of a partial fill section become too wet to permit suitable bond between these surfaces and the additional fill to be placed thereon, the wet material shall be scarified and permitted to dry, assisted by discing or harrowing, if necessary, to such depths as may be directed by the contracting officer. The material shall be dried to an acceptable moisture content, and shall be compacted in accordance with the applicable requirements of paragraph COMPACTION.

#### 3.17.1.3 Drying Wet Material

Material that is too wet shall be dried in the borrow area prior to bringing to the levee embankment be assisted by discing or harrowing, if necessary, until the moisture content is reduced to an amount within the

specified limits.

#### 3.17.1.4 Increasing Moisture in Dry Material

The moisture content of material that is too dry, will be adjusted on the levee embankment. The Contractor will add water to the fill material and by harrowing, or other approved methods, work the moisture into the material until a uniform distribution of moisture within the specified limits is obtained. Water applied on a layer of fill on the levee embankment shall be accurately controlled in amount so that free water will not appear on the surface during or subsequent to rolling. Should too much water be added to any part of the embankment, the rolling on that section of the embankment shall be delayed until the moisture content of the materials is reduced to an amount within the specified limits. If it is impracticable to obtain the specified moisture content by wetting or drying the material on the fill, the Contractor may be required to pre-wet or dry back the material at the source of excavation or in the borrow area.

#### 3.17.2 Fine Drainage Gravel

Fine drainage gravel shall be placed, worked, and compacted in a saturated condition. The moisture content after compaction shall be as uniform as practicable throughout any one layer of fine drainage gravel.

### 3.18 COMPACTION

#### 3.18.1 Compaction Equipment

Compaction equipment shall conform to the following requirements and shall be used as prescribed in subsequent paragraphs.

##### 3.18.1.1 Tamping Rollers

Tamping rollers shall be as follows:

- a. Towed -Tamping rollers shall consist of a heavy duty double drum unit, with a drum diameter not less than 60 inches, and an individual drum length of not less than 60 inches. The drums shall be capable of being ballasted with water or a combination of sand and water. Each drum shall have staggered feet uniformly spaced over the cylindrical surface such as to provide approximately three tamping feet for each two square feet of drum surface. The tamping feet shall be 7 to 9 inches in clear projection from the cylindrical surface of the roller and shall have a face area of not less than 5 square inches nor more than 7 square inches. The roller shall be equipped with cleaning fingers, so designed and attached as to prevent the accumulation of material between the tamping feet, and these cleaning fingers shall be maintained at their full length throughout the periods of use of the roller. The weight of the roller shall not be less than 3500 pounds per foot of linear drum length weighted, and shall not be more than 2000 pounds per foot of drum length empty. The two drums comprising one roller unit shall be yoked such that they will oscillate when traversing uneven surfaces. The design and operation of the tamping roller shall be subject to the approval of the Contracting Officer who



shall have the right at any time during the prosecution of the work to direct such repairs to the tamping feet, minor alterations in the roller and variations in the weight as may be found necessary to secure optimum compaction of the earth fill materials. The Contractor may be required to add ballast to the roller to the maximum capacity specified by the manufacturer of the roller. The roller shall be drawn by a crawler-type or a rubber-tired tractor at a speed not to exceed 3.5 miles per hour. The use of the rubber-tired tractor shall be discontinued if the tires leave ruts that prevent uniform compaction by the tamping roller. If tamping rollers are used in tandem, not more than two rollers in tandem will be permitted and in such case, one trip of the tandem rollers over any surface will be considered as two passes. When tamping rollers are used in tandem, the tamper foot spacing shall be offset so that the circumferential rows on the rear drums are in line with the mid-point of the circumferential rows on the forward drums.

b. Self-propelled - Conditioned upon satisfactory performance, self-propelled tamping rollers may be used in lieu of tractor-drawn tamping rollers. Self-propelled rollers exceeding the empty weight requirement may be used provided that by the substitution of tamping feet, having a face area not exceeding 14 square inches, the nominal foot pressure on the tamping feet of the self-propelled roller can be adjusted to approximate the nominal foot pressure of the towed roller for the particular working condition required for the towed rollers. The tamping feet shall be 7 to 9 inches in clear projection from the cylindrical surface of the roller. For self-propelled rollers, in which steering is accomplished through use of rubber-tired wheels, the tire pressure shall not exceed 40 pounds per square inch. Self-propelled rollers shall be operated at a speed not to exceed 3.5 miles per hour. Self-propelled tamping rollers may be used in lieu of tractor drawn tamping rollers provided the foot pressure on the tamping feet of the self-propelled roller are approximately the same as the foot pressure on the towed roller. For self-propelled rollers steered with rubber-tired wheels, the tire pressure shall not exceed 40 pounds per square inch. Self-propelled rollers shall be operated at speeds not exceeding 3.5 miles per hour. The Contracting Officer has the authority to limit or eliminate the use of self-propelled rollers if they are found to cause shearing or laminations of the compacted fill.

#### 3.18.1.2 Vibratory Rollers

Vibratory rollers for compacting rock fills, pervious sand and gravel fills, or filter and transition drainage layers shall be equipped with a smooth steel compaction drum and shall be operated at a frequency of vibration during compaction operations between 1100 and 1500 vpm. Vibratory rollers may be either towed or self-propelled and shall have an unsprung drum weight that is a minimum of 60 percent of the rollers' static weight. Towed rollers shall have at least 90 percent of their weight transmitted to the ground through the compaction drum when the roller is standing in a level position hitched to the towing vehicle. Rollers for compacting rockfill, sand and gravel fills, or filter and drainage layers shall have a minimum static weight of 20,000 pounds, a minimum dynamic force of 40,000 pounds when operating at 1400 vpm, and an applied force not less than 9,000 pounds per foot of compaction drum length. The level of

amplitude and vibration frequency during compaction will be maintained uniform throughout the embankment zone within which it is operating. Rollers shall be operated at speeds not to exceed 1.5 mph. The equipment manufacturer shall furnish sufficient data, drawings, and computation for verification of the above specifications, and the character and efficiency of this equipment shall be subject to approval.

#### 3.18.1.3 Rubber-tired Rollers

Rubber-tired rollers shall have a minimum of four wheels equipped with pneumatic tires. The tires shall be of such size and ply as to be capable of being operated at tire pressures between 80 and 100 pounds per square inch at an 25,000 pound wheel load. The roller wheels shall be located abreast and so designed that each wheel will carry approximately equal load in traversing uneven ground. The spacing of the wheels shall be such that the distance between the nearest edges of adjacent tires will not be greater than 50 percent of the rated tire width of a single tire at the operating pressure for an 25,000 pound wheel load. The roller shall be provided with a body suitable for ballast loading such that the load per wheel may be varied, as directed by the Contracting Officer, from 18,000 to 25,000 pounds. The roller shall be towed at a speed not to exceed 5 miles per hour. The character and efficiency of this equipment shall be subject to the approval of the Contracting Officer.

#### 3.18.1.4 Hand Operated Compactors

Compaction of material, in areas where it is impracticable to use a roller or tractor compaction shall be performed by the use of approved hand operated power compactors.

a. Power Tampers: Power tampers shall be hand operated equipment capable of compacting material in confined areas. The compactors shall be either an internal combustion or pneumatic activated tamper. Tampers shall have sufficient weight and striking power to produce the specified compaction. The character and efficiency of this equipment shall be subject to the approval of the Contracting Officer.

b. Vibratory Plate Compactor: Vibratory compactors operated by hand in confined areas shall utilize the oscillating cam principal and shall deliver an impact of not less than 2000 pounds at a rate of approximately 2000 impulses per minute. The character and efficiency of this equipment shall be subject to the approval of the Contracting Officer.

#### 3.18.1.5 Crawler-type Tractors

Crawler-type tractors used for spreading or compaction shall weigh not less than 20,000 pounds, shall exert a unit tread pressure of not less than 6 pounds per square inch, and shall not be operated at a speed to exceed 3.5 miles per hour.

#### 3.18.1.6 Sprinkling Equipment

Sprinkling equipment shall consist of tank trucks, pressure distributors or

other equipment designed to apply water uniformly and in controlled quantities to variable width of surface.

#### 3.18.1.7 Miscellaneous Equipment

Scarifiers, disks, spring-tooth or spike-tooth harrows, spreaders, and other equipment shall be suitable for use in embankment construction and approved by the Contracting Officer. Equipment used for blending fill material shall be capable of penetrating the full loose lift thickness of the specific material type.

#### 3.18.2 Compaction

After a layer of material has been dumped and spread, it shall be harrowed to break up and blend the fill materials and to obtain uniform moisture distribution. Harrowing shall be performed with a heavy disk plow, or other approved harrow, to the full depth of the layer. If one pass of the harrow does not accomplish the breaking up and blending of the materials, additional passes of the harrow shall be required, but in no case will more than 4 passes of the harrow on any one layer be required for this purpose. When the moisture content and the condition of the layer are satisfactory, the lift shall be compacted to a minimum of 90 percent of the maximum dry density as determined by the Contractor in accordance with ASTM D 698 with not less than six complete coverages of an approved tamping roller or four complete coverages of an approved 50-ton rubber-tired roller traversing in a direction parallel to the axis of the levee. In areas which are not accessible by roller, the fill shall be placed in layers not more than 4 inches in uncompacted depth and compacted with an approved hand operated compactor to a density equal to that obtained in other areas which are accessible to rollers. Dumping, spreading, sprinkling, and compacting may be performed at the same time at different points along a section when there is sufficient area to permit these operations to proceed simultaneously. Compaction equipment shall be operated such that the strip being traversed by the roller shall overlap the rolled adjacent strip by not less than 3 feet.

#### 3.18.3 Compaction of Embankment Fill

After a layer of material has been dumped and spread, it shall be harrowed to break up and blend the fill materials and to obtain uniform moisture distribution. Harrowing shall be performed with a heavy disk plow, or other approved harrow, to the full depth of the layer. If one pass of the harrow does not accomplish the breaking up and blending of the materials, additional passes of the harrow shall be required, but in no case will more than 4 passes of the harrow on any one layer be required for this purpose. When the moisture content and the condition of the layer are satisfactory, the lift shall be compacted with not less than six complete coverages of an approved tamping roller traversing in a direction parallel to the axis of the levee. If the desired compaction to a minimum of 90 percent of the maximum dry density as determined by the Contractor in accordance with ASTM D 698 is not achieved, additional rolling will be required. In areas which are not accessible by roller, the fill shall be placed in layers not more than 4 inches in uncompacted depth and compacted with an approved hand operated compactor to a density equal to that obtained in other areas which

are accessible to rollers. Dumping, spreading, sprinkling, and compacting may be performed at the same time at different points along a section when there is sufficient area to permit these operations to proceed simultaneously. Compaction equipment shall be operated such that the strip being traversed by the roller shall overlap the rolled adjacent strip by not less than 3 feet.

#### 3.18.4 Compaction Adjacent to Structures and Utilities

Heavy equipment for spreading and compacting fill shall not be operated within 4 feet of structures or utilities, except as otherwise specified herein. Material within 4 feet shall be compacted using appropriate hand operated compactors specified herein.

#### 3.18.5 Topsoil

Topsoil shall be placed on the embankment surfaces as shown on the contract drawings.

### 3.19 FIELD QUALITY CONTROL

#### 3.19.1 Clearing, Grubbing, and Stripping

The Contractor shall establish and maintain quality control for clearing, grubbing, and stripping operations to assure compliance with contract requirements, and maintain records of the quality control for all construction operations including but not limited to the items indicated below. These records, as well as the records of corrective actions taken, shall be furnished to the Government in accordance with Section 01451 CONTRACTOR QUALITY CONTROL.

##### 3.19.1.1 Clearing

Station to station limits, transverse clearing limits from applicable centerline; percentage of area complete; types of materials cleared.

##### 3.19.1.2 Grubbing

Station to station limits, transverse grubbing limits from applicable centerline; percentage of area complete; type of material; filling of grubbed holes.

##### 3.19.1.3 Stripping

Station to station limits, transverse stripping limits from applicable centerline; percentage of area complete; type of material; depth of stripping.

#### 3.19.2 Excavation

The Contractor shall establish and maintain quality control for excavation operations to assure compliance with contract requirements, and maintain records of the Contractor's quality control for all construction operations including but not limited to the following:

- a. Lines, grades and tolerances,
- b. Segregation of materials,
- c. Disposal and/or stockpiling of materials,
- d. Unsatisfactory materials,
- e. Conditions that may induce seepage or weaken the foundation or embankment,
- f. Stability of excavations.

Records of inspections and tests, as well as the records of corrective actions taken, shall be furnished to the Government in accordance with Section 01451 CONTRACTOR QUALITY CONTROL.

### 3.19.3 Embankment

#### 3.19.3.1 General

As a part of the Contractor Quality Control (CQC) system required by SECTION 01451 CONTRACTOR QUALITY CONTROL, the Contractor shall establish and maintain field quality control for foundation preparation, embankment and backfill operations to assure compliance with contract requirements and maintain detailed records of field quality control for all operations including but not limited to the following:

- a. Earthwork Equipment

Type, size, number of units and suitability for construction of the prescribed work.

- b. Foundation Preparation

Methods of preparing the foundations in advance of embankment and backfill construction and methods for providing drainage of the foundation and partially completed fills.

#### 3.19.3.2 Materials Testing

The contractor shall perform sufficient testing to insure that the fill is being constructed as specified. The testing program specified below shall be considered the minimum acceptable frequency of testing. This does not relieve the Contractor from the responsibility of performing additional testing, if required to ensure compliance with these specifications.

- a. Soil Classification Tests

Soil classification tests shall be performed in accordance with ASTM D 2487. One initial classification test shall be required for each different classification of material to be utilized as embankment fill or backfill. As prescribed in ASTM D 2487, grain

size analyses in accordance with ASTM D 422 and Atterberg limits in accordance with ASTM D 4318 shall be performed on each different classification. The Contractor shall submit additional tests for every 200 cubic yards of embankment or backfill material. Soil classification tests shall be performed on foundation material as required to determine the acceptability of the in-situ soils. Additional tests will be required if noticeable changes in the material occur.

b. Cohesive Material Testing

(1) Moisture Density Relationships. The moisture-density relations for each different classification of cohesive material utilized shall be determined in accordance with ASTM D 698, Method A. Prior to placing any fill material containing cohesive material, a minimum of 3 five-point compaction test shall be performed on representative samples of the material to be used as fill. During fill placement a minimum of one additional moisture-density test shall be performed for every 200 cubic yard placed. Additional tests will be required each time a new material is encountered. The moisture-density curves will be compiled to form a family of curves which will be utilized to estimate optimum properties (maximum dry density and optimum moisture content) to be used with field density test.

(2) Water (Moisture) Content Tests. Determination of water content shall be performed in accordance with ASTM D 2216. ASTM D 4643 may be used when rapid moisture content results are needed. All rapid results obtained by ASTM D 4643 shall be confirmed by a test on a duplicate sample performed in accordance with ASTM D 2216. In the event of disagreement between the results, ASTM D 2216 shall govern. One water content test will be performed for each 200 cubic yards of material placed or each lift of material whichever is less. Backfill and fills not meeting the required specifications for water content shall be retested after corrective measures have been applied.

(3) In-place Density Testing for Cohesive Materials. The in-place density of the cohesive materials shall be determined in accordance with ASTM D 1556, ASTM D 2167, ASTM D 2922, ASTM D 2937, or ASTM D 5195. At least one (1) in-place density test shall be performed on each lift of material or every 200 cubic yards of completed fill whichever is more frequent with the horizontal locations randomly staggered in the fill. At each field density test location, soil samples shall be obtained and one two-point compaction test, one moisture content, one grain size analysis, and one Atterberg limits test, if applicable, shall be performed on the sample. The results of the two-point compaction test and the moisture content test will be utilized to obtain the optimum properties to compare to the results of the in-place density test. Fill not meeting the required specifications for in-place density shall be retested after additional compaction has been completed. When nuclear method is used for in-place density testing according to ASTM D 2922 and ASTM D 3017, the first test and every tenth

test thereafter for each material type shall include a sand cone correlation test in accordance with ASTM D 1556. The sand cone test shall be performed adjacent to the location of the nuclear test, shall include a nominal 6 inch diameter sand cone, and shall include a minimum wet soil weight of 6 pounds extracted from the hole. Nuclear density testing equipment shall not be used during rain. The density correlations shall be submitted with test results. Each transmittal including density test data shall include a summary of all density correlations for the job neatly prepared on a summary sheet including at a minimum:

- (i) Meter serial number and operators initials.
- (ii) Standard count for each test.
- (iii) Material type.
- (iv) Probe depth.
- (v) Moisture content by each test method and the deviation.
- (vi) Wet density by each test method and the deviation.

c. Cohesionless Material Testing

(1) Compaction Tests. The Contractor shall run not less than one relative density test for every 1000 cubic yards of cohesionless fill in accordance with ASTM D 4253 and ASTM D 4254.

(2) In-Place Density Tests. The in-place density of the cohesionless materials shall be determined in accordance with ASTM D 1556, ASTM D 2167, ASTM D 2922, ASTM D 2937, or ASTM D 5195. The Contractor shall run not less than one (1) field in-place density test on every 200 cubic yards of completed embankment fill or backfill whichever is less. Horizontal locations shall be randomly staggered in the fill. When nuclear method is used for in-place density testing according to ASTM D 2922 and ASTM D 3017, the first test and every tenth test thereafter for each material type shall include a sand cone correlation test in accordance with ASTM D 1556. The sand cone test shall be performed adjacent to the location of the nuclear test, and shall include a nominal 6 inch diameter sand cone, and shall include a minimum wet soil weight of 6 pounds extracted from the hole. The density correlations shall be submitted with test results. Each transmittal including density test data shall include a summary of all density correlations for the job neatly prepared on a summary sheet including at a minimum:

- (i) Meter serial number and operators initials.
- (ii) Standard count for each test.
- (iii) Material type.
- (iv) Probe depth.
- (v) Moisture content by each test method and the deviation.
- (vi) Wet density by each test method and the deviation.

(3) Water (Moisture) Content Tests. Determination of water content shall be performed in accordance with ASTM D 2216. ASTM D 4643 may be used when rapid moisture content results are needed. All rapid results obtained by ASTM D 4643 shall be confirmed by a

test on a duplicate sample performed in accordance with ASTM D 2216.

In the event of disagreement between the results, ASTM D 2216 shall govern. One water content test will be performed for each 200 cubic yards of material placed or each lift of material whichever is less. Backfill and fills not meeting the required specifications for water content shall be retested after corrective measures have been applied.

d. Additional Testing

The Contracting Officer may request additional tests if there is reason to doubt the adequacy of the compaction, or special compaction procedures are being used, or materials change or if the Contracting Officer determines that the Contractor's testing is inadequate or the Contractor is concentrating backfill and fill operations in a relatively small area.

3.19.3.3 Materials

Suitability of materials for use in embankment and backfill.

3.19.3.4 Fill Placement

Layout, maintaining existing drainage, moisture control, thickness of layers, removal of oversized material, spreading and compaction for embankment and backfill.

3.19.3.5 Grade and Cross Section

Surveys to verify that the dimensions, slopes, lines and grades conform to those shown on the drawings.

3.19.3.6 Reporting

On a daily basis, the Contractor shall furnish the inspection records and all material testing results, the quantity of fill placed, as well as the records of corrective action taken, in accordance with Section 01451 CONTRACTOR QUALITY CONTROL.

-- End of Section --



## SECTION 02370A

## CELLULAR CONFINEMENT SYSTEM (CELLS)

03/00

Item No. 55 - Cellular Confinement System

Item No. 56 - Erosion Control Blanket

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## U.S. DEPARTMENT OF AGRICULTURE (USDA)

AMS Seed Act (1995) Federal Seed Act Regulations Part 201

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) (ASTM)

ASTM D 648	(1998c) Deflection Temperature of Plastics Under Flexural Load
ASTM D 977	(1998) Emulsified Asphalt
ASTM D 1248	(1998) Polyethylene Plastics Molding and Extrusion Materials
ASTM D 1682	Tensile Strength and % Strength Retention of material after 1000 hours of exposure in Xenon Arc Weatherometer
ASTM D 1777	(1996) Thickness of Textile Materials
ASTM D 3776	(1996) Mass per Unit Area (Weight) of Fabric
ASTM D 3787	(1989) Burst Strength of Knitted Goods: Constant-Rate-of-Traverse (CRT), Ball Burst Test
ASTM D 3884	(1992) Test Method for Abrasion Resistance of Textile Fabrics (Rotary Platform, Double Head Method)
ASTM D 4355	(1992) Deterioration of Geotextiles From

	Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
ASTM D 4491	(1999) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991; R 1996) Trapezoidal Tearing Strength of Geotextiles
ASTM D 4595	(1986; R 1994) Tensile Properties of Geotextiles by the Wide-Width Strip Method
ASTM D 4632	(1991; R 1996) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1999) Determining Apparent Opening Size of a Geotextile
ASTM D 4833	(1998; R 1996el) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 5035	(1995) Breaking Force and Elongation of Textile Fabrics (Strip Method)

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

Layout; G  
Obstructions Below Ground; G

Scale drawings defining areas to receive recommended materials as required by federal, state or local regulations.

### Seed Establishment Period

Calendar time period for the seed establishment period. When there is more than one seed establishment period, the boundaries of the seeded area covered for each period shall be described.

### Maintenance Record

Record of maintenance work performed, of measurements and findings for product failure, recommendations for repair, and products replaced.

### SD-03 Product Data

Geotextile Fabrics; G  
Synthetic Grid Systems; G

Manufacturer's literature including physical characteristics,  
application and installation instructions.

Equipment

A listing of equipment to be used for the application of erosion  
control materials.

Finished Grade; G  
Erosion Control Blankets; G

Condition of finish grade status prior to installation; location  
of underground utilities and facilities.

#### SD-04 Samples

Materials

- a. Geosynthetic and synthetic binding material; 1 quart.
- b. Geotextile fabrics; 6 inch square.
- c. Erosion control blankets; 6 inch square.
- d. Synthetic grid systems; One sample grid.
- e. Two color charts displaying the colors and finishes for the  
articulating cellular block system.

#### SD-06 Test Reports

Geosynthetic Binders  
Erosion Control Blankets  
Cellular Confinement System - Synthetic Grid Systems

Certified reports of inspections and laboratory tests, prepared  
by an independent testing agency, including analysis and  
interpretation of test results. Each report shall be properly  
identified. Test methods used and compliance with recognized test  
standards shall be described.

Gravel; G

Sieve test results. Sand shall be uniformly graded.

#### SD-07 Certificates

Fill Material  
Geotextile Fabrics

Prior to delivery of materials, certificates of compliance

attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following.

For items listed in this section:

- a. Certification of recycled content or,
- b. Statement of recycled content.
- c. Certification of origin including the name, address and telephone number of manufacturer.

#### Geosynthetic Binders

Certification for binders showing EPA registered uses, toxicity levels, and application hazards.

#### Erosion Control Plan Construction Work Sequence Schedule

Erosion control plan. Construction sequence schedule.

#### Installer's Qualification

The installer's company name and address; training and experience and or certification.

#### Recycled Plastic

Individual component and assembled unit structural integrity test; creep tolerance; deflection tolerance; and vertical load test results. The estimated percentage of recovered material content in the material and components. Life-cycle durability.

#### Seed; G

Classification, botanical name, common name, percent pure live seed, minimum percent germination and hard seed, maximum percent weed seed content, and date tested.

#### SD-10 Operation and Maintenance Data

##### Maintenance Instructions

Instruction for year-round care of installed material. The Contractor shall include manufacturer supplied spare parts.

### 1.3 DESCRIPTION OF WORK

The work shall consist of furnishing and installing soil surface erosion control materials, including fine grading, blanketing, stapling, mulching and miscellaneous related work, within project limits and in areas outside

the project limits where the soil surface is disturbed from work under this contract at the designated locations. This work shall include all necessary materials, labor, supervision and equipment for installation of a complete system. This section shall be coordinated with the requirements of Section 02300 EARTHWORK and Section 02921 SEEDING.

#### 1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

Materials shall be stored in designated areas and as recommended by the manufacturer protected from the elements, direct exposure, and damage. Containers shall not be dropped from trucks. Material shall be free of defects that would void required performance or warranty. Geosynthetic binders and synthetic soil binders shall be delivered in the manufacturer's original sealed containers and stored in a secure area.

- a. Erosion control blankets and geotextile fabric shall be furnished in rolls with suitable wrapping to protect against moisture and extended ultraviolet exposure prior to placement. Erosion control blanket and geotextile fabric rolls shall be labeled to provide identification sufficient for inventory and quality control purposes.
- b. All synthetic grids, synthetic sheets, and articulating cellular concrete block grids shall be sound and free of defects that would interfere with the proper placing of the block or impair the strength or permanence of the construction. Minor cracks in synthetic grids and concrete cellular block, incidental to the usual methods of manufacture, or resulting from standard methods of handling in shipment and delivery, shall not be deemed grounds for rejection.
- c. Seed shall be inspected upon arrival at the jobsite for conformity to species and quality. Seed that is wet, moldy, or bears a test date five months or older, shall be rejected.

#### 1.5 SUBSTITUTIONS

Substitutions will not be allowed without written request and approval from the Contracting Officer.

#### 1.6 INSTALLER'S QUALIFICATION

The installer shall be certified by the manufacturer for training and experience installing the material.

#### 1.7 TIME LIMITATIONS

Backfilling the openings in synthetic grid systems and articulating cellular concrete block systems shall be completed a maximum 7 days after placement to protect the material from ultraviolet radiation.

#### 1.8 WARRANTY

Erosion control material shall have a warranty for use and durable

condition for project specific installations. Temporary erosion control materials shall carry a minimum eighteen month warranty. Permanent erosion control materials shall carry a minimum three year warranty.

## PART 2 PRODUCTS

### 2.1 RECYCLED PLASTIC

Recycled plastic shall contain a minimum 85 percent of recycled post-consumer product. Recycled material shall be constructed or manufactured with a maximum 1/4 inch deflection or creep in any member, according to ASTM D 648 and ASTM D 1248. The components shall be molded of ultraviolet (UV) and color stabilized polyethylene. The material shall consist of a minimum 75 percent plastic profile of high-density polyethylene, low-density polyethylene, and polypropylene raw material. The material shall be non-toxic and have no discernible contaminants such as paper, foil, or wood. The material shall contain a maximum 3 percent air voids and shall be free of splinters, chips, peels, buckling, and cracks. Material shall be resistant to deformation from solar heat gain.

### 2.2 BINDERS

#### 2.2.1 Geosynthetic Binders

Geosynthetic binders shall be manufactured in accordance with ASTM D 1560, ASTM D 2844; and shall be referred to as products manufactured for use as modified emulsions for the purpose of erosion control and soil stabilization. Emulsions shall be manufactured from all natural materials and provide a hard durable finish.

### 2.3 MULCH

#### 2.3.1 Straw

Straw shall be stalks from oats, wheat, rye, barley, or rice, furnished in air-dry condition and with a consistency for placing with commercial mulch-blowing equipment.

#### 2.3.2 Hay

Hay shall be native hay, sudan-grass hay, broomsedge hay, or other herbaceous mowings, furnished in an air-dry condition suitable for placing with commercial mulch-blowing equipment.

#### 2.3.3 Asphalt Adhesive

Asphalt adhesive shall conform to the following: Emulsified asphalt, conforming to ASTM D 977, Grade SS-1; and cutback asphalt, conforming to ASTM D 2028, Designation RC-70.

### 2.4 GEOTEXTILE FABRICS

Geotextile fabrics shall be woven of polypropylene filaments formed into a stable network so that the filaments retain their relative position to each

other. Sewn seams shall have strength equal to or greater than the geotextile itself. Fabric shall be installed to withstand maximum velocity flows as recommended by the manufacturer. The geotextile shall conform to the following minimum average roll values:

Property	Performance	Test Method
Weight		ASTM D 3776
Thickness		ASTM D 1777
Permeability		ASTM D 4491
Abrasion Resistance,	58 percent X	
Type (percent strength retained)	81 percent	ASTM D 3884
Tensile Grab Strength	1,467 N X 1, 933 N	ASTM D 4632
Grab Elongation	15percent X 20percent	ASTM D 4632
Burst Strength	5,510 kN/m <sup>2</sup>	ASTM D 3787
Puncture Strength	733 N	ASTM D 4833
Trapezoid Tear	533 N X 533 N	ASTM D 4533
Apparent Opening Size	40 US Std Sieve	ASTM D 4751
UV Resistance @ 500 hrs	90 percent	ASTM D 4355

## 2.5 EROSION CONTROL BLANKETS

### 2.5.1 Erosion Control Blankets Type II

Erosion control blankets shall be a machine-produced mat of 100 percent straw. The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with a polypropylene netting having an approximate 1/2 by 1/2 inch mesh with photodegradable accelerators to provide breakdown of the netting within approximately 45 days, depending upon geographic location and elevation. The blanket shall be sewn together on a maximum 1.5 inch centers with degradable thread. The erosion control blanket shall have the following properties:

#### Material Content

Straw	100 percent with approximately .50 lb/yd <sup>2</sup> weight.
Netting	One side only, photodegradable with photo accelerators and approximately 1.64 lb/1,000 ft <sup>2</sup> weight.
Thread	Degradable

NOTE: Photodegradable life a minimum of 10 months with a minimum 90 percent light penetration. Apply to slopes up to a maximum 3:1 gradient.

### 2.5.2 Seed

See section 02490 PLANTING for seed specifications.

### 2.5.3 Staples

Staples shall be as recommended by the manufacturer.

## 2.6 SYNTHETIC GRID AND SHEET SYSTEMS

Synthetic grid and sheet systems may be formed of recycled plastic in accordance with paragraph 2.1 RECYCLED PLASTICS and have interlocking components to form a uniform underlayment or strata to receive fill.

### 2.6.1 Synthetic Cellular Confinement System (Cells)

Grids shall be made of modular interlocking components. Blocks shall be formed as rigid interlocking components or as expandable sheets and shall be manufactured to allow articulation upward and downward while restricting lateral movement. The assembled grid system shall articulate over three-directional vertical curves, both upward and downward. Nominal grid thickness shall be as indicated. The system shall provide 100 percent coverage of the area with the cells back filled.

## PART 3 EXECUTION

### 3.1 CONDITIONS

The Contractor shall submit a construction work sequence schedule, with the approved erosion control plan a minimum of 30 days prior to start of construction. The work schedule shall coordinate the timing of land disturbing activities with the provision of erosion control measures. Erosion control operations shall be performed under favorable weather conditions; when excessive moisture, frozen ground or other unsatisfactory conditions prevail, the work shall be stopped as directed. When special conditions warrant a variance to earthwork operations, a revised construction schedule shall be submitted for approval. Erosion control materials shall not be applied in adverse weather conditions which could affect their performance.

#### 3.1.1 Finished Grade

The Contractor shall verify that finished grades are as indicated on the drawings; finish grading and compaction shall be completed in accordance with Section 02300 "Earthwork", prior to the commencement of the work. The location of underground utilities and facilities in the area of the work shall be verified and marked. Damage to underground utilities and facilities shall be repaired at the Contractor's expense.

#### 3.1.2 Placement of Erosion Control Blankets

Before placing the erosion control blankets, ensure the subgrade has been graded smooth; has no depressed, void areas; is free from obstructions, such as tree roots, projecting stones or other foreign matter. Vehicles shall not be permitted directly on the blankets.



### 3.1.3 Synthetic Cellular Confinement System (Cells)

Before placing the grid system, ensure that the subgrade has been properly grubbed of large roots and rocks; compacted; has been graded smooth; has no depressed, void, soft or uncompacted areas; is free from obstructions, such as tree roots, projecting stones or other foreign matter; and has been seeded.

### 3.1.4 Site Preparation

#### 3.1.4.1 Soil Excavation

The foundation soil shall be excavated or filled as required to the footing grades and dimensions as shown on the drawings or as directed by the Contracting Officer.

#### 3.1.4.2 Soil Testing

The foundation soil shall be proof rolled and examined by the Contracting Officer to ensure that it meets minimum strength requirements according to the design assumptions. If unacceptable foundation soils are encountered, the Contractor shall excavate the affected areas and replace said areas with suitable quality material under the direction of the Contracting Officer.

#### 3.1.4.3 Native Soil

In cut areas, the native soil shall be excavated to the lines and grades shown on the plans and moved to a suitable location for reuse as directed by the Contracting Officer. The procedures, extent, and scheduling of temporary excavations for the reinforced earth retention structure shall be approved by the Contracting Officer.

### 3.1.5 Placement of the Cells

#### 3.1.5.1 Placing and Dimensioning of the Cells

Cell sections, with dimensions according to the plan, shall be expanded into position and infilled with the specified granular infill. The individual cell sections can be held in their expanded positions with a suitable stratcher frame or steel J-Hooks driven inside selected outer cells prior to drilling. When a cell section is fully expanded, the individual cell should measure 9.6 by 8.0 inches (transverse axis : longitudinal axis). The edges of adjacent cell sections in a given layer shall be either inter-leafed or butted against each other, depending on which side is being joined. In all cases, the upper surfaces of adjoining cells shall be flush at the joint. Adjoining cell sections shall be mechanically fastened to each other with either hot rings ('C' rings) or staples per the manufacturer's recommendations.

#### 3.1.5.2 Filling of the Cells

The cell sections are to be filled either manually or with equipment appropriate to the site conditions. Overfill the cells and level to approximately 1 (one) inch above the top of the cell walls. Compact the infill to a minimum 95% Standard Proctor density. Remove all excess overfill so that the fill material is flush with the top of the cell walls.

#### 3.1.5.3 Nonwoven Geotextile

When indicated on the plan, unroll strips of nonwoven geotextile along the outer edge of the infilled cells system prior to placing the next level.

#### 3.1.6 Displacement of Cells

To avoid displacement of cell sections during construction, no heavy compaction equipment shall be allowed within 3 (three) feet of the back of the in-place cell sections.

#### 3.1.7 Retained Soil Placement (Fill Situation)

Retained soil shall be placed behind the infill soil in maximum lift thicknesses of 8 (eight) inches and compacted to 95% Standard Proctor density.

#### 3.1.8 Material Handling and Storage

##### 3.1.8.1 Material Handling

The Contractor shall check all materials which are a part of the reinforced slope or earth retention structures and have been delivered to the site, to ensure that the correct materials have been received.

##### 3.1.8.2 Material Storage

Materials shall be stored on site in a manner that will insure that no damage will occur to any of the materials. Damaged materials shall be replaced at the Contractor's expense.

### 3.2 SITE PREPARATION

#### 3.2.1 Soil Test

Soil shall be tested in accordance with ASTM D 5268 and ASTM D 4972 for determining the particle size and mechanical analysis. Sample collection onsite shall be random over the entire site. The test shall determine the soil particle size as compatible for the specified material.

#### 3.2.2 Layout

Erosion control material locations may be adjusted to meet field conditions. When soil tests result in unacceptable particle sizes, a shop

drawing shall be submitted indicating the corrective measures.

### 3.2.3 Protecting Existing Vegetation

When there are established lawns in the work area, the turf shall be covered and/or protected or replaced after construction operations. Existing trees, shrubs, and plant beds that are to be preserved shall be barricaded along the dripline. Damage to existing trees shall be mitigated by the Contractor at no additional cost to the Government. Damage shall be assessed by a state certified arborist or other approved professional using the National Arborist Association's tree valuation guideline.

### 3.2.4 Obstructions Below Ground

When obstructions below ground affect the work, shop drawings showing proposed adjustments to placement of erosion control material shall be submitted for approval.

## 3.3 INSTALLATION

### 3.3.1 Seeding

When seeding is required prior to installing mulch on synthetic grid systems the Contractor shall verify that seeding will be completed in accordance with Sections 02300 "Earthwork" and 02921 "Seeding".

### 3.3.2 Mechanical Anchor

Mechanical anchor shall be a V-type-wheel land packer; a scalloped-disk land packer designed to force mulch into the soil surface; or other suitable equipment.

### 3.3.3 Non-Asphaltic Tackifier

Hydrophilic colloid shall be applied at the rate recommended by the manufacturer, using hydraulic equipment suitable for thoroughly mixing with water. A uniform mixture shall be applied over the area.

### 3.3.4 Erosion Control Blankets

a. Erosion control blankets shall be installed as indicated and in accordance with manufacturer's recommendations. The extent of erosion control blankets shall be as shown on drawings.

b. Erosion control blankets shall be oriented in vertical strips and anchored with staples, as indicated. Adjacent strips shall be abutted to allow for installation of a common row of staples. Horizontal joints between erosion control blankets shall be overlapped sufficiently to accommodate a common row of staples with the uphill end on top.

c. Where exposed to overland sheet flow, a trench shall be located at the uphill termination. The erosion control blanket shall be stapled to the bottom of the trench. Backfill and

compact the trench as required.

d. Where terminating in a channel containing an installed blanket, the erosion control blanket shall overlap installed blanket sufficiently to accommodate a common row of staples.

### 3.3.5 Synthetic Sheet System

Synthetic sheet systems shall be anchored in accordance with the manufacturer's recommendation. Systems shall be placed on a well graded surface and then backfilled, a maximum seven days after placement, to protect the material from ultraviolet radiation. As the installation progresses, backfilling shall include contiguous perimeter termination trenches.

#### 3.3.5.1 Sheet System Revegetation

For areas not requiring re-vegetation, openings shall be backfilled to grade with well graded fill and surface prepared for finish as indicated on the drawings. For areas requiring re-vegetation, openings shall be backfilled using well graded fill and topsoil as indicated on the drawings.

#### 3.3.5.2 Sheet System Grids

Each pair of grids shall cover grade without gaps or open spaces between them. The system shall provide 100 percent coverage of the area with the cells backfilled.

#### 3.3.5.3 Sheet System Seeding

Seed shall be installed in accordance with Section 02921 SEEDING.

#### 3.3.5.4 Grid System Grids - Cellular Confinement System (Cells)

Synthetic grid cellular confinement systems (cells) shall be anchored in accordance with the manufacturer's recommendation. Interlocking grid systems shall be placed on well graded surface and the backfilling of openings shall be completed a maximum 7 days after placement, to protect the material from ultraviolet radiation. As the installation progresses, backfilling shall include contiguous perimeter termination trenches.

### 3.3.6 Grids

#### 3.3.6.1 Grid System Revegetation

For areas not requiring re-vegetation, openings shall be backfilled with a minimum 1/2 inch nominal size crushed rock, to a minimum 2 inch depth.

#### 3.3.6.2 Synthetic Grids

Each pair of grids shall cover grade without gaps or open spaces between them. The system shall provide 100 percent coverage of the area with the cells backfilled.

### 3.3.6.3 Grid System Seeding

Seed shall be installed in accordance with Section 02921 SEEDING.

### 3.3.7 Articulating Cellular Concrete Block System Installation

#### 3.3.7.1 Backfilling Cellular Block System

Backfilling of openings between blocks shall be completed a maximum of 7 days after placement of the filter, to protect the geotextile from ultraviolet radiation. As the installation progresses, backfilling shall include contiguous perimeter termination trenches.

#### 3.3.7.2 Seeding, Fertilizing, Mulching

Seed shall be installed in accordance with Section 02921 SEEDING.

### 3.4 CLEAN-UP

Excess material, debris, and waste materials shall be disposed offsite at an approved landfill or recycling center. Adjacent paved areas shall be cleared. Immediately upon completion of the installation in an area, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed. Signage shall be in accordance with Section 10430 EXTERIOR SIGNAGE.

### 3.5 WATERING SEED

Watering shall be started immediately after installing erosion control blanket type XI (revegetation mat). Water shall be applied to supplement rainfall at a sufficient rate to ensure moist soil conditions to a minimum 1 inch depth. Run-off and puddling shall be prevented. Watering trucks shall not be driven over turf areas, unless otherwise directed. Watering of other adjacent areas or plant material shall be prevented.

### 3.6 MAINTENANCE RECORD

A record shall be furnished describing the maintenance work performed, record of measurements and findings for product failure, recommendations for repair, and products replaced.

#### 3.6.1 Maintenance

Maintenance shall include eradicating weeds; protecting embankments and ditches from surface erosion; maintaining the performance of the erosion control materials and mulch; protecting installed areas from traffic.

##### 3.6.1.1 Maintenance Instructions

Written instructions containing drawings and other necessary information shall be furnished, describing the care of the installed material; including, when and where maintenance should occur, and the procedures for material replacement.

#### 3.6.1.2 Patching and Replacement

Unless otherwise directed, material shall be placed, seamed or patched as recommended by the manufacturer. Material not meeting the required performance as a result of placement, seaming or patching shall be removed from the site. The Contractor shall replace the unacceptable material at no additional cost to the Government.

#### 3.7 SATISFACTORY STAND OF GRASS PLANTS

When erosion control blanket type XI (revegetation mat) is installed, the grass plants shall be evaluated for species and health when the grass plants are a minimum 1 inch high. A satisfactory stand of grass plants from the revegetation mat area shall be a minimum 10 grass plants per square foot. The total bare spots shall not exceed 2 percent of the total revegetation mat area.

-- End of Document --

## SECTION 02378A

GEOTEXTILES USED AS FILTERS  
05/95

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 123	(1996a) Standard Terminology Relating to Textiles
ASTM D 4354	(1996) Sampling of Geosynthetics for Testing
ASTM D 4355	(1992) Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
ASTM D 4491	(1999) Water Permeability of Geotextiles By Permittivity
ASTM D 4533	(1991; R 1996) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991; R 1996) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1999) Determining Apparent Opening Size of a Geotextile
ASTM D 4833	(1988; R 1996) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 4873	(1997) Identification, Storage, and Handling of Geosynthetic Rolls
ASTM D 4884	(1996) Strength of Sewn or Thermally Bonded Seams of Geotextiles

## U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 1110-2-1601	(1991; Change 1-1994) Hydraulic Design of Flood Conttol Channels
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## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-04 Samples

##### Geotextile

If requested, submit geotextile samples for testing to determine compliance with the requirements in this specification. When required, submit samples a minimum of 60 days prior to the beginning of installation of the same textile. Upon delivery of the geotextile, submit duplicate copies of the written certificate of compliance signed by a legally authorized official of the manufacturer. The certificate shall state that the geotextile shipped to the site meets the chemical requirements and exceeds the minimum average roll value listed in TABLE 1, MINIMUM PHYSICAL REQUIREMENTS FOR DRAINAGE GEOTEXTILE. Upon request, supply quality control and quality assurance tests for the geotextile. All samples provided shall be from the same production lot as will be supplied for the contract, and shall be the full manufactured width of the geotextile by at least 10 feet long, except that samples for seam strength may be a full width sample folded over and the edges stitched for a length of at least 5 feet. Samples submitted for testing shall be identified by manufacturers lot designation. For needle punched geotextile, the manufacturer shall certify that the geotextile has been inspected using permanent on-line metal detectors and does not contain any needles.

#### SD-07 Certificates

##### Geotextile

Submit the manufacturer's certification of the geotextile material.

### 1.3 SHIPMENT, HANDLING, AND STORAGE

#### 1.3.1 Shipment and Storage

Only approved geotextile rolls shall be delivered to the project site. All geotextile shall be labeled, shipped, stored, and handled in accordance with ASTM D 4873. No hooks, tongs, or other sharp instruments shall be used for handling geotextile.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Geotextile



## 2.1.1.1 General

The geotextile shall be a non-woven pervious sheet of plastic yarn as defined by ASTM D 123. The geotextile shall equal or exceed the minimum average roll values listed in TABLE 1, MINIMUM PHYSICAL REQUIREMENTS FOR DRAINAGE GEOTEXTILE. Strength values indicated in the table are for the weaker principal direction.

TABLE 1  
MINIMUM PHYSICAL REQUIREMENTS FOR DRAINAGE GEOTEXTILE

PROPERTY	UNITS	ACCEPTABLE VALUES	TEST METHOD
GRAP STRENGTH	lb	200	ASTM D 4632
SEAM STRENGTH	lb	200	ASTM D 4632
PUNCTURE	lb	80	ASTM D 4833
TRAPEZOID TEAR	lb	40	ASTM D 4533
PERMEABILITY	cm/sec	0.1	ASTM D 4491
APPARENT OPENING SIZE	U.S. SIEVE	No. 70	ASTM D 4751
PERMITTIVITY	sec -1	0.1	ASTM D 4491
ULTRAVIOLET DEGRADATION	Percent	50 AT 500 Hrs 50 AT 500 Hrs	ASTM D 4355

## 2.1.1.2 Geotextile Fiber

Fibers used in the manufacturing of the geotextile shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of polyolefins, polyesters, or polyamides. Stabilizers and/or inhibitors shall be added to the base polymer if necessary to make the filaments resistant to deterioration caused by ultraviolet light and heat exposure. Reclaimed or recycled fibers or polymer shall not be added to the formulation. Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the edges. The edges of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile.

## 2.1.2 Seams

The seams of the geotextile shall be sewn with thread of a material meeting the chemical requirements given above for geotextile yarn or shall be bonded by cementing or by heat. The sheets of geotextile shall be attached at the factory or another approved location, if necessary, to form sections not less than 2 feet wide. Seams shall be tested in accordance with method ASTM D 4884. The strength of the seam shall be not less than 90 percent of the required grab tensile strength of the unaged geotextile in any

principal direction.

### 2.1.3 Securing Pins

The geotextile shall be secured to the embankment or foundation soil by pins to prevent movement prior to placement of revetment materials. Other appropriate means to prevent movement such as staples, sand bags, and stone could also be used. Securing pins shall be inserted through both strips of overlapped geotextile along the line passing through midpoints of the overlap. Securing pins shall be removed as placement of revetment materials are placed to prevent tearing of geotextile or enlarging holes maximum spacing between securing pins depends on the steepness of the embankment slope. The maximum pins spacing shall be equal to or less than the values listed in TABLE 2, MAXIMUM SPACING FOR SECURING PINS. When windy conditions prevail at the construction site, the number of pins should be increased upon the demand of the Contracting Officer. Terminal ends of the geotextile shall be anchored with key trench or apron at crest, toe of the slope and upstream and downstream limits of installation.

TABLE 2  
MAXIMUM SPACING FOR SECURING PINS

EMBANKMENT	SPACING, feet
STEEPER THAN 1V ON 3H	2
1V ON 3H TO 1V ON 4H	3
FLATTER THAN 1V ON 4H	5

## 2.2 INSPECTIONS, VERIFICATIONS, AND TESTING

### 2.2.1 Manufacturing and Sampling

Geotextiles and factory seams shall meet the requirements specified in TABLE 1, MINIMUM PHYSICAL REQUIREMENTS FOR DRAINAGE GEOTEXTILE. Geotextiles shall be randomly sampled in accordance with ASTM D 4354 (Procedure Method A). Factory seams shall be sampled at the frequency specified in ASTM D 4884.

### 2.2.2 Site Verification and Testing

Samples shall be collected at approved locations upon delivery to the site in accordance with ASTM D 4354 (Procedure Method B). Samples shall be tested to verify that the geotextile meets the requirements specified in TABLE 1, MINIMUM PHYSICAL REQUIREMENTS FOR DRAINAGE GEOTEXTILE. Samples shall be identified by manufacturers name, type of geotextile, lot number, roll number, and machine direction. Testing shall be performed at an approved laboratory. Test results from the lot under review shall be submitted and approved prior to deployment of that lot of geotextile. Rolls which are sampled shall be immediately rewrapped in their protective

covering.

## PART 3 EXECUTION

### 3.1 SURFACE PREPARATION

Surface on which the geotextile will be placed shall be prepared to a relatively smooth surface condition, in accordance with the applicable portion of this specification and shall be free from obstruction, debris, depressions, erosion feature, or vegetation. Any irregularities will be removed so as to insure continuous, intimate contact of the geotextile with all the surface. Any loose material, soft or low density pockets of material, will be removed; erosion features such as rills, gullies etc. must be graded out of the surface before geotextile placement.

### 3.2 INSTALLATION OF THE GEOTEXTILE

#### 3.2.1 General

The geotextile shall be placed in the manner and at the locations shown. At the time of installation, the geotextile shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage.

#### 3.2.2 Placement

The geotextile shall be placed with the long dimension parallel to the centerline of the channel outfall structure and laid smooth and free of tension, stress, folds, wrinkles, or creases. The strips shall be placed to provide a minimum width of 24 inches of overlap for each joint. The placement procedure requires that the length of the geotextile be approximately 10 percent greater than the slope length. The Contractor shall adjust the actual length of the geotextile used based on initial installation experience. Temporary pinning of the geotextile to help hold it in place until the riprap is placed shall be allowed. The temporary pins shall be removed as the riprap is placed to relieve high tensile stress which may occur during placement of material on the geotextile. Design protection of riprap should be in compliance with EM 1110-2-1601. Trimming shall be performed in such a manner that the geotextile shall not be damaged in any way.

### 3.3 PROTECTION

The geotextile shall be protected at all times during construction from contamination by surface runoff and any geotextile so contaminated shall be removed and replaced with uncontaminated geotextile. Any damage to the geotextile during its installation or during placement of riprap shall be replaced by the Contractor at no cost to the Government. The work shall be scheduled so that the covering of the geotextile with a layer of the specified material is accomplished within 7 calendar days after placement of the geotextile. Failure to comply shall require replacement of geotextile. The geotextile shall be protected from damage prior to and during the placement of riprap or other materials. Care should be taken to ensure that the utilized cushioning materials shall not impede the flow of

water. Before placement of riprap or other materials, the Contractor shall demonstrate that the placement technique will not cause damage to the geotextile. In no case shall any type of equipment be allowed on the unprotected geotextile.

### 3.4 PLACEMENT OF CUSHIONING MATERIAL

Placing of cushioning material shall be performed in a manner to insure intimate contact of the geotextile with the prepared surface and with the cushioning material. The placement shall also be performed in a manner that shall not damage the geotextile including tear, puncture, or abrasion.

On sloping surfaces the cushioning material shall be placed from the bottom of the slopes upward. During placement, the height of the drop of riprap material shall not be greater than 12 inches. Any geotextile damaged beneath the cushioning material shall be uncovered as necessary and replaced at no cost to the Government.

### 3.5 OVERLAPPING AND SEAMING

#### 3.5.1 Overlapping

The overlap of geotextile rolls shall be 24 inches. Appropriate measures will be taken to insure required overlap exists after cushion placement.

#### 3.5.2 Sewn Seams

High strength thread should be used such that seam test should conform to ASTM D 4884. The thread shall meet the chemical, ultraviolet, and physical requirements of the geotextile, and the color shall be different from that of the geotextile. The seam strength shall be equal to the strength required for the geotextile in the direction across the seam. Overlapping J-type seams are preferable over prayer-type seams as the overlapping geotextile reduces the chance of openings to occur at the seam. Double sewing shall be used specially for field seams to provide a safety factor against undetected missed stitches.

-- End of Section --

## SECTION 02380

## STONE PROTECTION

08/99

- Item No. 11 - Riprap
- Item No. 12 - Crushed Stone
- Item No. 13 - Bedding Material

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33	(1999) Concrete Aggregates
ASTM C 127	(1988; R 1993) Specific Gravity and Absorption of Coarse Aggregate
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 295	(1998) Petrographic Examination of Aggregates for Concrete
ASTM D 75	(1997) Sampling Aggregates
ASTM D 653	(1997) Standard Terminology Relating to Soil, Rock, and Contained Fluids
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 3740	(1996) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM D 4791	(1995) Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D 4992	(1994) Evaluation of Rock to be Used for Erosion Control

ASTM D 5312	(1992) Evaluation of Durability of Rock for Erosion Control Under Freezing and Thawing Conditions
ASTM D 5313	(1992; R 1997) Evaluation of Durability of Rock for Erosion Control Under Wetting and Drying Conditions
ASTM D 5519	(1994) Particle Size Analysis of Natural and Man-Made Riprap Materials
ASTM E 548	(1994) General Criteria Used for Evaluating Laboratory Competence

#### CORPS OF ENGINEERS (COE)

COE CRD-C 144	(1992) Resistance of Rock to Freezing and Thawing
COE CRD-C 148	(1969) Testing Stone for Expansive Breakdown on Soaking in Ethylene Glycol
COE CRD-C 169	(1993) Resistance of Rock to Wetting and Drying

#### ENGINEERING MANUALS (EM)

EM 1110-2-1601	(1994) Hydraulic Design of Flood Control Channels
EM 1110-2-1906	(1986) Laboratory Soils Testing

#### NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44	(1997) NIST Handbook 44: Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices
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## 1.2 GOVERNMENT TESTING AND STUDIES

### 1.2.1 Stone

#### 1.2.1.1 Sources

Stone shall be furnished from any of the sources at the option of the Contractor that may be furnished from any source designated by the Contractor and accepted by the Contracting Officer, subject to the conditions herein stated, or to determine whether acceptable stone can be produced from the proposed source. Satisfactory service records on other work may be acceptable. In order for stone to be acceptable on the basis of service records, stone of a similar size must have been placed in a similar thickness and exposed to weathering under similar conditions as are anticipated for this contract, and must have satisfactorily withstood such weathering for a minimum of 5 years. If no such records are available, the Government will require the contractor to conduct tests to assure the acceptability of the stone. In addition to an acceptable 5 year service record, the Contracting Officer has the option to elect to have representative samples taken and tested.

#### 1.2.1.2 Evaluation Testing of Stone

Tests. The tests will be conducted in accordance with applicable Corps of Engineers methods of tests given in the Handbook for Concrete and Cement or ASTM methods of tests.

### 1.3 SUBMITTALS

Government approval is required for all submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-01 Data

Riprap; G. Bedding Material; G.

Submit the source for materials used in riprap, crushed stone, and bedding.

#### SD-09 Reports

Gradation Test; G.

Submit the gradation tests using the GRADATION TEST DATA SHEET enclosed at end of this section for riprap or stone.

Evaluation Tests; G.

Quality test on the stone in accordance with PART 2 paragraph EVALUATION TESTING OF STONE shall be the responsibility of the Contractor. Prior to delivery of such material to the worksite, submit a copy of the laboratory inspection report along with actions taken to correct deficiencies. Submit a copy of the test reports.

Bedding Material; G.

Submit test reports attesting that the bedding material.

#### SD-13 Certificates

Stone; G. Bedding Material; G.

Submit certificates of compliance attesting that the materials meet specification requirements.

Laboratory; G.

Submit a copy of the documents, provided by the Materials Testing Center (MTC) at CEWES, that validates that the laboratory can perform the required tests. The individual tests shall be listed for which the validation covers along with the date of the inspection.

Weigh Scale Certification; G.

Submit a copy of the certification from the regulation agency attesting to the scale's accuracy.

Certified Weight Scale Tickets; G.

Submit a copy of each certified weight scale ticket 15 working day(s) after weighing.

#### SD-14 Samples

Stone; G.

Submit suitable stone samples prior to delivery of any such material to the worksite if stone is not from one of the stone sources listed at the end of this section.

#### SD-18 Records

Bulk Specific Gravity; G.

At least 60 calendar days in advance of shipment of stone to the work site, submit a copy of bulk specific gravity test results for each gradation range of stone proposed to be furnished. The information shall be furnished prior to preparation of pre-production demonstration stockpiles.

### 1.4 REGULATORY REQUIREMENTS



The regulatory requirements listed below form a part of this specification to the extent referenced. The regulatory requirements are referred to in the text by basic designation only.

NJ STATE HIGHWAY AND TRANSPORTATION DEPARTMENT (DOT)

(2000) Standard Specifications for Highway Construction

1.5 CONSTRUCTION TOLERANCES

The finished surface and stone layer thickness shall not deviate from the lines and grades shown by more than the tolerances listed below. Tolerances are measured perpendicular to the indicated neatlines. Extreme limits of the tolerances given shall not be continuous in any direction for more than five (5) times the nominal stone dimension nor for an area greater than 1000 square feet of the structure surface.

NEATLINE TOLERANCES

MATERIAL	ABOVE NEATLINE inches	BELOW NEATLINE inches
Foundation	0.5	0.5
Bedding	2	2
Riprap	4	4

The intention is that the work shall be built generally to the required elevations, slope and grade and that the outer surfaces shall be even and present a neat appearance. Placed material not meeting these limits shall be removed or reworked as directed by the Contracting Officer. Payment will not be made for excess material which the Contracting Officer permits to remain in place.

1.6 TERMINOLOGY

1.6.1 Bank Stabilization

This paragraph explains certain terminology which is common to construction of bank stabilization work on the slopes channel bottom and which may not be self explanatory in the subsequent applicable provisions of the technical specifications and on the drawings.

1.6.2 Stone Protection

Stone Protection is defined as a system which includes a layer of bedding material or layers of filter material beneath a layer or layers of riprap. Stone protection is placed around structures in slack water or within a dewatered site. Stone protection may also be used to protect channel banks when it is placed in the dry or in slack water.

### 1.6.3 Riprap

Riprap is defined as a material having a gradation band similar to those specified in EM 1110-2-1601, Chapter 3, uniform graded material. Riprap is normally produced by mechanical methods, with a jaw crusher and grizzly after the stone has been mined by blasting in a quarry. Riprap gradations have a maximum top size of 3.5 tons.

## PART 2 PRODUCTS

### 2.1 BEDDING MATERIAL

#### 2.1.1 General

Bedding material shall consist of gravel and crushed stone.

#### 2.1.2 Material

Bedding material shall be composed of tough, durable particles, adequately free from thin, flat and elongated pieces, and shall contain no organic matter nor soft, friable particles in quantities considered objectionable by the Contracting Officer. The aggregates shall meet the quality requirements of ASTM C 33 or paragraph REGULATORY REQUIREMENTS. Gradation shall conform to the following requirements:

#### BEDDING STONE NO. 1 GRAVEL OR CRUSHED STONE

3 in.	100
1 1/2 in.	70-100
1/2 in.	50-70
No. 4	30-50
No. 10	0-30

The bedding material shall be well-graded between the limits shown. At

least one test shall be performed on each 100 cubic yards. A representative sample weighting not less than 100 pounds shall be removed from the bedding layer placed at locations directed by the Contracting Officer. All points on individual grading curves obtained from representative samples of bedding material shall lie between the boundary limits as defined by smooth curves drawn through the tabulated gradation limits plotted on ENG FORM 2087 or similar form. The individual gradation curves within these limits shall not exhibit abrupt changes in slope denoting either gap grading or scalping of certain sizes or other irregularities which would be detrimental to the proper functioning of the bedding layers.

## 2.2 STONE

### 2.2.1 General

#### 2.2.1.1 Evaluation Testing of Stone

The Contractor shall have evaluation tests performed on stone samples collected from the proposed source. The quarry investigation shall be performed by a registered geologist or registered engineer. The tests to which the stone shall be subjected include petrographic examination (ASTM C 295), bulk specific gravity (SSD), unit weight, absorption (ASTM C 127), resistance of stone to freezing and thawing (COE CRD-C 144ASTM D 5312), and if argillaceous limestone and sandstone are used, resistance to wetting and drying (COE CRD-C 169ASTM D 5313).

The laboratory to perform the required testing shall be validated based on compliance with ASTM E 548 and relevant paragraphs of ASTM D 3740, and no work requiring testing shall be permitted until the laboratory has been inspected and validated. The first inspection of the facilities shall be at the expense of the Government and any subsequent inspections required because of failure of the first inspection shall be at the expense of the Contractor.

a. Bulk Specific Gravity Range. All stone shall have a minimum bulk specific gravity, saturated surface dry (SSD), of 2.50 and a maximum bulk specific gravity of not more than 2.90 based upon water having a unit weight of 62.4 pounds per cubic foot. The method of test for bulk specific gravity (SSD) shall be ASTM C 127.

b. Unit Weight and Absorption. Stone shall weigh more than 155 pounds per cubic foot have a bulk specific gravity, saturated surface dry, greater than 2. The stone shall have an absorption less than 2 percent unless other tests and service records show that the stone is satisfactory. The method of test for unit weight and absorption shall be ASTM C 127, except the unit weight shall be calculated in accordance with Note No. 5 using bulk specific gravity, saturated surface dry.

c. Petrographic Examination. Stone shall be evaluated in accordance

with ASTM C 295 which shall include information required by ASTM D 4992, paragraph 10. COE CRD-C 148 shall be used to perform Ethylene glycol tests required on rocks containing smectite as specified in ASTM D 4992 and on samples identified to contain swelling clays.

d. Resistance to Freezing and Thawing. Stone shall have a maximum loss of 10 percent after the number of cycles specified in ASTM D 5312, Figure 1, when determining the durability of stone when subjected to freezing and thawing in accordance with COE CRD-C 144ASTM D 5312, except the surface area of one side of the sample shall be between 144 square inches and 2304 square inches.

e. Resistance of Rock to Wetting and Drying. Stone shall have a maximum loss of 1 percent when determining the durability of stone when subject to wetting and drying in accordance with COE CRD-C 169, ASTM D 5313, except the surface area of one side of the sample shall be between 144 square inches and 2304 square inches.

f. Samples. Samples of stone shall be taken by a representative of the Quarry under the supervision of the Contracting Officer for testing and acceptance prior to delivery of any stone from this source to the site of the work. Information provided with the samples shall include the location within the quarry from which the sample was taken along with a field examination of the quarry. The field examination shall include the information outline in ASTM D 4992, paragraph 7. Samples shall consist of at least three pieces of stone, roughly cubical in shape and weighing not less than 150 pounds each from each unit that shall be used in the production of the required stone. If the source is an undeveloped quarry, or if the operation has been dormant for more than one year such that fresh samples are not available, the Contractor shall expose fresh rock for 20 feet horizontally and for the full height of the face proposed for production, prior to the field evaluation. The Contracting Officer may also require documentation of subsurface exploration of an undeveloped quarry in order to determine whether or not sufficient reserves are available. The samples shall be shipped at the Contractor's expense to a laboratory validated by the government to perform the required tests.

g. Tests. The tests shall be conducted by the Contractor in accordance with applicable ASTM and Corps of Engineers methods of tests given in the Handbook for Concrete and Cement, and shall be performed at a laboratory validated by the government. The cost of testing shall be borne by the Contractor.

#### 2.2.1.2 Quarry Operations

Quarry operations shall be conducted by the Contractor in a manner that shall produce stone conforming to the requirements specified and may involve selective quarrying, handling, processing, blending, and loading as necessary, all of which shall be as specified in Section 01451 CONTRACTOR QUALITY CONTROL. Blasting and handling of rock shall be controlled by the Contractor to produce rock of the size ranges and quality specified.

Techniques such as the use of proper hole diameter, hole depth, hole angle, burden and spacing distances, types and distribution of explosives. delay intervals and sequence, removal of muck piles between each shot, and special handling techniques are required as necessary to produce the specified materials. All aspects of blasting operations shall be specifically designed so that the end product is not damaged from the blasting technique and that the stone is suitable for the intended purpose.

#### 2.2.1.3 Curing Stone

The Contractor shall conduct curing operations on freshly quarried stone to allow it to release stored energy and moisture and to allow the stone to demonstrate that it will not fracture during the energy release and drying-out phase. Stones of sizes which are individually picked shall be temporarily stockpiled at the quarry site a minimum of 60 calendar days before being shipped to the project site, unless this requirement is waived by the Contracting Officer. Such waiver will be granted only if the stone has characteristics that make curing unnecessary.

#### 2.2.1.4 Temporary Storage at Quarry

Storage of stone materials subsequent to shipment from the quarry and prior to permanent placement in the required work shall be subject to approval of the Contracting Officer.

#### 2.2.1.5 Gradation Test

The Contractor shall perform a gradation test or tests on the riprap, stone, or at the quarry in accordance with paragraph GRADATION TEST METHOD FOR RIPRAP, GRADED STONE, AND. The sample shall be taken by the Contractor in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer not less than 3 days in advance of each test. In the event of unavailability of the Contracting Office, the Contractor shall perform the tests and certify to the Contracting Officer that the riprap, stone, or shipped complies with the specifications. At least one gradation test(s) shall be performed per 50,000 tons of each size of riprap, stone, placed, but not less than one test shall be performed. The gradation tests shall be reported using the forms, GRADATION TEST DATA SHEET and ENG FORM 4794-R, attached at end of this section. The Contractor shall designate on the test form that portion in tons of the lot tested which is applicable to this contract. Any deviation from the reported tonnage shall be corrected and recorded on a revised GRADATION TEST DATA SHEET. The sample shall consist of not less than 25 tons of riprap, stone and shall be collected in a random manner which will provide a sample which accurately reflects the actual gradation arriving at the jobsite. Failure of the test on the initial sample and on an additional sample will be considered cause for rejection of the quarry and/or quarry process, and all riprap, stone represented by the failed tests shall be set aside and not incorporated

into the work. Any additional tests required because of the failure of an initial test sample will not be considered as one of the other required tests. If collected by the truckload, each truckload shall be representative of the gradation requirements. The Contracting Officer may direct additional testing of the riprap, stone at the project site if the riprap, stone, appears, by visual inspection, to be out of gradation. The additional tests shall be performed on in-place materials at the locations directed, or on random loads selected by the Contracting Officer. In-place test areas shall be not less than 12 feet by 12 feet and shall include the full thickness of the placed riprap, stone, or layer, without disturbing or including the underlying material and shall meet the minimum sample size specified above. Each pit excavated for an in-place test sample shall be refilled and reworked to provide a surface void of signs of disturbance. One in-place gradation shall be performed on each 5,000 cubic yards or portion thereof placed. If the gradation test fails, additional gradation tests will be required at the Contractor's expense to delineate the limits of unacceptable stone. The additional gradation tests shall not count as part of the minimum number of gradation tests required. The unacceptable stone shall either be reworked to bring the stone within the specified gradation or the stone shall be removed from the project site as determined by the Contracting Officer. The Contracting Officer may direct this testing under the Contract Clause INSPECTION OF CONSTRUCTION. The Contractor shall provide all necessary screens, scales and other equipment, and operating personnel, and shall grade the sample. Certification and test results shall represent riprap, stone, shipped from the quarry. Certification and tests results must be received by the Contracting Officer at the jobsite before the riprap, stone is used in the work.

#### 2.2.1.6 Proportional Dimension Limitations

The maximum aspect ratio (greatest dimension:least dimension) of any piece of stone for size ranges which are not graded with a screen or grizzly, shall be not greater than 3:1 when measured across mutually perpendicular axis. Not more than 25 percent (25%) of the stones within a gradation range shall have an aspect ratio greater than 2.5:1. A maximum of 10 percent flat and elongated pieces by weight will be acceptable. A flat and elongated piece of riprap is defined as having a ratio of width to thickness or length to width greater than 3:1. ASTM D 4791 shall be used as a guide to perform the test.

#### 2.2.1.7 Riprap Stone Stockpile

Storage of riprap stone at the worksite is not to be confused with off-site stockpiling of riprap, stone. If the Contractor elects to provide off-site stockpiling areas, the Contracting Officer shall be notified by the Contractor of all such areas. The Contractor's stockpile shall be a maximum of 12 feet high and formed by a series of layers of truckload dumps, where the rock essentially remains where it is placed. Subsequent layers shall be started 10 feet from the edge of the previous layer so that the rock will not roll down the edges of the previous layers. The first

layer shall be a maximum of 6 feet high. After being stockpiled, any riprap, stone, which has become contaminated with soil or refuse shall not be put into the work unless the contaminating material has been removed from the riprap, stone prior to placement.

#### 2.2.1.8 Worksite Stockpile

Riprap, stone, or bedding material delivered to the work sites, which requires temporary storage shall be placed in a container suitable for storing the riprap, stone without waste, or a sand-clay-gravel or crushed stone pad may be constructed for the storage area and removed upon completion of the work. If the sand-clay-gravel or crushed stone pad method is used, the pad shall have a minimum thickness of at least 6 inches.

The container or sand-clay-gravel or crushed stone pad method shall be subject to approval prior to delivery of the riprap, stone. Upon completion of the work, the storage areas shall be cleaned of all storage residues and returned to their natural condition. Temporary storage of riprap, stone at the worksite will be allowed, provided the stockpile toe of the riprap, stone be no closer than 60 linear feet from the closest edge of the stream's top slope, and the amount shall not exceed 200 tons unless otherwise approved.

#### 2.2.1.9 Off-site Stockpile

In areas where riprap, stone is stockpiled for placement, the area shall have excess rock removed prior to completion of work. All rock and spalls greater than 3 inches in diameter shall be removed. Where rocks may have become buried due to soft ground or operation of the equipment, the rock shall be disposed of as directed. After the rock has been removed, the storage area shall be graded, dressed, and filled to return the ground surface as near as practical to the condition that existed prior to construction.

#### 2.2.2 Riprap

Only quarried stone shall be used. Riprap quality shall be as specified in paragraph GOVERNMENT TESTING AND STUDIES, subparagraph STONE. Stone shall be well graded and shall conform to the table(s) below.

TABLE 1  
(FOR RIPRAP 30" LAYER)

PERCENT LIGHTER BY WEIGHT (SSD)	LIMITS OF STONE WEIGHT, LB.
100	1350
50-100	600
35-60	200
0-2	100

TABLE 2  
(FOR RIPRAP 24" LAYER)

PERCENT LIGHTER BY WEIGHT (SSD)	LIMITS OF STONE WEIGHT, LB.
100	690
75-100	350
35-60	150
0-18	50

TABLE 3  
(FOR RIPRAP 18" LAYER)

PERCENT LIGHTER BY WEIGHT (SSD)	LIMITS OF STONE WEIGHT, LB.
100	290
75-100	150
40-65	70
10-35	40
0-15	20

TABLE 4  
(FOR RIPRAP 15" LAYER)

PERCENT LIGHTER BY WEIGHT (SSD)	LIMITS OF STONE WEIGHT, LB.
100	170
65-100	70
40-60	40
5-40	25
0-10	10



TABLE 5  
(FOR RIPRAP 12" LAYER)

PERCENT LIGHTER BY WEIGHT (SSD)	LIMITS OF STONE WEIGHT, LB.
100	86
75-100	40
40-65	20
15-45	13
0-15	5

TABLE 6  
(FOR RIPRAP 9" LAYER)

PERCENT LIGHTER BY WEIGHT (SSD)	LIMITS OF STONE WEIGHT, LB.
100	36.5
70-100	14.0
35-65	9.0
0-30	4.0

### PART 3 EXECUTION

#### 3.1 BASE PREPARATION

Areas on which geotextile bedding material and riprap are to be placed shall be graded and/or dressed to conform to cross sections shown on the contract drawings within an allowable tolerance of plus 2 inches and minus 4 inches from the theoretical slope lines and grades. The prepared base shall be approved by the Contracting Officer. Where such areas are below the allowable minus tolerance limit they shall be brought to grade by fill with earth similar to the adjacent materia and then compacted to a density equal to the adjacent in place material. As an alternative, these areas may be filled with bedding material. No payment will be made for any material thus required. Immediately prior to placing the geotextile and bedding layers, the prepared base will be inspected by the Contracting Officer and no material shall be placed thereon until that area has been approved.

##### 3.1.1 Placement of Geotextile

Installation of geotextile shall be as specified in Section 02378a GEOTEXTILES USED AS FILTERS. The geotextile may be placed in shallow still

water of one foot depth or less.

### 3.2 PLACEMENT OF BEDDING LAYERS

#### 3.2.1 General

A bedding layer, consisting of a 6-inch layer of crushed stone, shall be placed on the prepared base as described below, in accordance with the details shown on the contract drawings, and within the limits shown on the contract drawings or staked in the field.

A tolerance of plus 2 inches and minus 1 inch from the slope lines and grades shown on the contract drawings will be allowed in the finished surface of the bedding, except that the extreme of this tolerance shall not be continuous over an area greater than 200 square feet.

#### 3.2.2 Placement of Bedding Material on Prepared Base

Bedding material shall be spread uniformly on the geotextile over the prepared base to the slope lines and grades as indicated on the contract drawings and in such manner as to avoid damage to the prepared base. Placing of crushed stone by methods which tend to segregate the particle sizes within the bedding layer or cause mixing of the separate layers will not be permitted. Placement shall begin at the bottom of the area to be covered and continue up slope. Subsequent loads of material shall be placed against previously placed material in such a manner as to ensure a relatively homogenous mass. Any damage to the surface of the prepared base during placing of the material shall be repaired before proceeding with the work. Compaction of material placed on the prepared base will not be required, but the material surface shall be finished to present an adequately even surface, free from mounds or windrows. The bedding layers may be prepared in shallow still water of one foot depth or less provided the required placement can be obtained without segregation of the particle sizes.

### 3.3 PLACEMENT OF CRUSHED STONE LAYER

Crushed stone shall be spread uniformly on the geotextile to the slope lines and grades as indicated on the contract drawings and in such manner as to avoid damage to the geotextile. The crushed stone may be placed in shallow still water of one foot depth or less. Placement shall begin at the bottom of the area to be covered and continue up slope. Subsequent loads of material shall be placed against previously placed material in such a

manner as to ensure a relatively homogenous mass. Placing of crushed stone by methods which tend to segregate the particle sizes within the filter layer will not be permitted. Any damage to the surface of the geotextile during placement of crushed stone filter stone shall be repaired before proceeding with the work. Compaction of material placed on the geotextile will not be required, but shall be finished to present an adequately even surface, free from mounds or windrows.

### 3.4 PLACEMENT OF RIPRAP

#### 3.4.1 General

Riprap shall be placed on the bedding layer specified in paragraph(s) BEDDING MATERIAL or geotextile as specified in Section 02378 GEOTEXTILE USED AS FILTERS within the limits shown on the contract drawings.

#### 3.4.2 Placement

Riprap may be placed in still shallow water with flow velocities of approximately 3 feet per second or less and of depth approximately 2 feet or less, so as to provide visual inspection of proper placement. Riprap shall be placed in such manner as to produce a well graded mass of rock with the minimum practicable percentage of voids, and shall be constructed within the specified tolerances to the lines and grades shown on the drawings. Placement shall begin at the bottom of the area to be covered and continue up slope. Subsequent loads of material shall be placed against previously placed material in such a manner as to ensure a relatively homogenous mass. A tolerance of plus 2 inches or minus 2 inches from the slope lines and grades shown on the drawings will be allowed in the finished surface of the riprap, except that either extreme of such tolerance shall not be continuous over an area greater than 200 square feet.

The average tolerance of the entire job shall have no more than 50 percent of the tolerance specified above. No stone shall be dropped through air from a height greater than 3 feet and stones heavier than 500 pounds shall not be dropped from a height greater than 2 feet. The drop height of riprap with a top size greater than 500 pounds shall be less than 1 foot, but can be increased by placing a cushioning layer of sand. The larger stones shall be well distributed and the entire mass of stones in their final position shall be roughly graded to conform to the gradation specified in paragraph RIPRAP, subparagraph GENERAL. The finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones. Placing riprap in layers will not be permitted. Placing riprap by dumping into chutes or by similar methods likely to cause segregation of the various sizes will not be permitted. Placing riprap by dumping it at the top of the slope and pushing it down the slope will not be permitted. No equipment shall be operated directly on the completed stone protection system. The desired distribution of the various sizes of stones throughout the mass shall be obtained by selective loading of the material at the quarry or other source, by controlled dumping of successive loads during final placing, or by other methods of placement which will

produce the specified results. All dump trucks used in placing the riprap shall be equipped with bottom hinged tailgates. The gate releasing mechanism shall be arranged so that it may be operated only from, at, or near the front of the truck. Rearranging of individual stones will be required to the extent necessary to obtain a well-graded distribution of stone sizes as specified above. The Contractor shall maintain the stone protection until accepted by the Contracting Officer and any material displaced by any cause shall be replaced at his expense to the lines and grades shown on the drawings.

### 3.5 EARTHWORK

#### 3.5.1 Grading

All grading and filling shall be done to the lines and grades as staked in the field or as specified. Material used in making fills or restoring the subgrade shall be free from roots, brush or other debris; and shall be placed in layers not to exceed 1 foot in thickness. Each layer shall be thoroughly compacted to a density at least equal to that of the adjacent undisturbed earth. Excess material shall be spread on the slope adjacent to the area of repair.

#### 3.5.2 Excavation

Excavation shall be required in some failures where protrusion of stone above adjacent surface is objectionable. Where excavation is specified, the subgrades shall be excavated 10 to 12 inches below the surface of the adjacent paving. Large areas may not require excavating throughout, but excavation to the depths specified above will be required only for a distance of 5 feet inside the perimeter of the failure. Most of the excavation can be accomplished by mechanical means, but some hand work around the edges will be required. All work shall be to the lines and grades as staked in the field or as specified. Material resulting from the operation shall be used for making fills where required as specified in paragraph GRADING.

### 3.6 TESTS AND INSPECTIONS

#### 3.6.1 Placement Control

The Contractor shall establish and maintain quality control for all work performed at the job site under this section to assure compliance with contract requirements. He shall maintain records of his quality control tests, inspections and corrective actions. Quality control measures shall

cover all construction operations including, but not limited to, the placement of all materials to the slope and grade lines shown and in accordance with this section.

#### 3.6.1.1 Check Surveys

Surveys made by the Contractor are required on each material placed for determining that the materials are acceptably placed in the work. The Contractor shall make checks as the work progresses to verify lines, grades and thicknesses established for completed work. At least one (1) check survey as specified below shall be made by the Contractor for each twenty-five (25) foot section as shown as practicable after completion. Following placement of each type of material, the cross section of each step of the work shall be approved by the Contracting Officer before proceeding with the next step of the work. Approval of cross sections based upon check surveys shall not constitute final acceptance of the work.

Cross sections shall be taken by the Contractor on lines 25 feet apart, measured along the structure reference line, with readings at 5-foot intervals and at beaks along the lines. However, other cross section spacing and reading intervals may be used if determined appropriate by the Contracting Officer. Additional elevations shall be taken as the Contracting Officer may deem necessary or advisable. The surveys shall be conducted in the presence of an authorized representative of the Contracting Officer, unless this requirement is waived by the Contracting Officer.

#### 3.6.2 Bedding Layers

##### 3.6.2.1 General

The Contractor shall perform gradation tests to assure compliance with contract requirements and shall maintain detailed records. The bedding material shall be sampled in accordance with ASTM D 75 and tested in accordance with ASTM C 136. The Contractor shall perform the tests before and after surveys of each layer of stone protection material placed.

##### 3.6.2.2 Reporting

Reporting shall be in accordance with paragraph 2.2.1.3 Gradation Test.

#### 3.6.3 Gradation Tests for Stone

## G R A D A T I O N      T E S T      D A T A      S H E E T

EXAMPLE GRADATION  
SPECIFICATIONS

PERCENT LIGHTER BY WEIGHT

100  
50  
15

STONE WEIGHT IN LBS.

400 - 160  
160 - 80  
80 - 30

## EXAMPLE WORKSHEET

STONE SIZE LBS.	INDIVIDUAL WT. RETAINED	INDIVIDUAL PERCENT RETAINED	CUMULATIVE PERCENT RETAINED	PASSING
400	0	0	0	100
160	9,600	30	30	70
80	11,200	35	65	35
30	8,000	25	90	10
<30	3,200	10	100	-
TOTAL	32,000 pounds			

NOTE: Largest stone 251 pounds

## G R A D A T I O N      T E S T      D A T A      S H E E T

Quarry \_\_\_\_\_ Type of Stone Tested \_\_\_\_\_  
 Date of Test \_\_\_\_\_ Testing Rate \_\_\_\_\_

## T E S T      R E P R E S E N T S

Contract No.	District	Tons
	TOTAL	

## G R A D A T I O N

Stone Size	Weight	Individual	Cumulative	Specification
------------	--------	------------	------------	---------------

	G R A D A T I O N	T E S T	D A T A	S H E E T	
(lbs)	Retained	% Retained	% Ret.	% Pass	% Finer by wt
Total Weight					
Max Size Stone =					

Remarks:

I certify that the above stone sample is representative of the total tonnage covered by this test report.

Contractor Representative \_\_\_\_\_  
Government Representative \_\_\_\_\_

--End of Section--

## SECTION 02410

METAL SHEET PILING  
05/92

Item No. 18b - Steel Sheet Piling - PZ-27

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 6/A 6M	(1995b) General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A 328/A 328M	(1993a) Steel Sheet Piling
ASTM A 572/A 572M	(1994c) High-Strength Low-Alloy Columbium-Vanadium Structural Steel

## 1.2 SUBMITTALS

Government approval is required for all submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-04 Drawings

Metal Sheet Piling; G.

Detail drawings for sheet piling including fabricated sections shall show complete piling dimensions and details, driving sequence and location of installed piling. Detail drawings shall include details and dimensions of templates and other temporary guide structures for installing piling. Detail drawings shall provide details of the method of handling piling to prevent permanent deflection, distortion or damage to piling interlocks.

## SD-07 Schedules

Pile Driving Equipment; G.

Complete descriptions of sheet piling driving equipment including hammers, extractors, protection caps and other installation appurtenances shall be submitted for approval prior to commencement of work.

## SD-08 Statements



Pulling and Redriving; G.

The proposed method of pulling sheet piling shall be submitted and approved prior to pulling any piling.

#### SD-09 Reports

Interlocked Joint Strength in Tension Test; G.

The procedure for testing sheet piling interlocked joint strength in tension shall be submitted and approved prior to testing piling.

Materials Tests; G.

Certified materials tests reports showing that sheet piling and appurtenant metal materials meet the specified requirements shall be submitted for each shipment and identified with specific lots prior to installing materials. Material test reports shall meet the requirements of ASTM A 6/A 6M.

#### SD-18 Records

Driving; G.

Records of the sheet piling driving operations shall be submitted after driving is completed. These records shall provide a system of identification which shows the disposition of approved piling in the work, driving equipment performance data, piling penetration rate data, piling dimensions and top and bottom elevations of installed piling. The format for driving records shall be as directed.

### 1.3 DELIVERY, STORAGE AND HANDLING

Materials delivered to the site shall be new and undamaged and shall be accompanied by certified test reports. The manufacturer's logo and mill identification mark shall be provided on the sheet piling as required by the referenced specifications. Sheet piling shall be stored and handled in the manner recommended by the manufacturer to prevent permanent deflection, distortion or damage to the interlocks. Storage of sheet piling should also facilitate required inspection activities. Sheet piling over 80 feet in length shall be handled using a minimum of two pickup points.

## PART 2 PRODUCTS

### 2.1 METAL SHEET PILING

Metal sheet piling shall be hot-rolled steel sections conforming to ASTM A 328/A 328M. The interlocks of sheet piling shall be free-sliding, provide a swing angle suitable for the intended installation but not less than 5 degrees when interlocked, and maintain continuous interlocking when installed. Sheet piling shall be full-length sections of the dimensions shown. Sheet piling shall be provided with standard pulling holes. Metalwork fabrication for sheet piling shall be as specified and in Section 05055 METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS.

## 2.2 APPURTENANT METAL MATERIALS

Metal plates, shapes, bolts, nuts, rivets and other appurtenant fabrication and installation materials shall conform to manufacturer's standards and to the requirements specified in the respective sheet piling standards and in Section 05502 MISCELLANEOUS METAL MATERIALS, STANDARD ARTICLES, AND SHOP FABRICATED ITEMS.

## 2.3 TESTS, INSPECTIONS, AND VERIFICATIONS

Requirements for material tests, workmanship and other measures for quality assurance shall be as specified and in Section 05055 METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS.

### 2.3.1 Materials Tests

Materials tests shall conform to the following requirements. Sheet piling and appurtenant materials shall be tested and certified by the manufacturer to meet the specified chemical, mechanical and section property requirements prior to delivery to the site. Testing of sheet piling for mechanical properties shall be performed after the completion of all rolling and forming operations. Testing of sheet piling shall meet the requirements of ASTM A 6/A 6M.

### 2.3.2 Interlocked Joint Strength in Tension Test

The interlocked joint strength in tension test shall conform to the piling manufacturer's standard test, include testing at least two 3 inch long coupons taken randomly from different as-produced pilings of each heat and must be approved.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Pile Driving Equipment

Pile driving equipment shall conform to the following requirements.

##### 3.1.1.1 Driving Hammers

Hammers shall be steam, air, or diesel drop, single-acting, double-acting, differential-acting, or vibratory type. The driving energy of the hammers shall be as recommended by the manufacturer for the piling weights and subsurface materials to be encountered.

#### 3.1.2 Placing and Driving

##### 3.1.2.1 Placing

Any excavation required within the area where sheet pilings are to be installed shall be completed prior to placing sheet pilings. Pilings shall be carefully located as shown or directed. Pilings shall be placed plumb with out-of-plumbness not exceeding 1/8 inch per foot of length and true to

line. Temporary wales, templates, master pilings, current deflectors or guide structures shall be provided to insure that the pilings are placed and driven to the correct alignment. At least two templates shall be used in placing each piling and the maximum spacing of templates shall not exceed 20 feet. Pilings properly placed and driven shall be interlocked throughout their length with adjacent pilings to form a continuous diaphragm throughout the length or run of piling wall.

#### 3.1.2.2 Driving

Pilings shall be driven at the location as shown on the plans with the proper size hammer and by approved methods so as not to subject the pilings to damage and to ensure proper interlocking throughout their lengths. Driving hammers shall be maintained in proper alignment during driving operations by use of leads or guides attached to the hammer. A protecting cap shall be employed in driving when using impact hammers to prevent damage to the tops of pilings. Pilings damaged during driving or driven out of interlock shall be removed and replaced at the Contractor's expense.

Pilings shall be driven without the aid of a water jet. Adequate precautions shall be taken to insure that pilings are driven plumb. If at any time the forward or leading edge of the piling wall is found to be out-of-plumb in the plane of the wall the piling being driven shall be driven to the required depth and tapered pilings shall be provided and driven to interlock with the out-of-plumb leading edge or other approved corrective measures shall be taken to insure the plumbness of succeeding pilings. The maximum permissible taper for any tapered piling shall be 1/8 inch per foot of length. Pilings in each run or continuous length of piling wall shall be driven alternately in increments of depth to the required depth or elevation. No piling shall be driven to a lower elevation than those behind it in the same run except when the pilings behind it cannot be driven deeper. If the piling next to the one being driven tends to follow below final elevation it may be pinned to the next adjacent piling. If obstructions restrict driving a piling to the specified penetration the obstructions shall be removed or penetrated with a chisel beam. If the Contractor demonstrates that removal or penetration is impractical the Contractor shall make changes in the design alignment of the piling structure as directed to insure the adequacy and stability of the structure. Pilings shall be driven to depths shown and shall extend up to the elevation indicated for the top of pilings. A tolerance of 1 inch above the indicated top elevation will be permitted. Pilings shall not be driven within 100 feet of concrete less than 7 days old.

#### 3.1.3 Cutting-Off and Splicing

Pilings driven to refusal or to the point where additional penetration cannot be attained and are extending above the required top elevation in excess of the specified tolerance shall be cut off to the required elevation. Pilings driven below the required top elevation and pilings damaged by driving and cut off to permit further driving shall be extended as required to reach the top elevation by splicing when directed at no additional cost to the Government. Pilings adjoining spliced pilings shall be full length unless otherwise approved. Splicing of pilings shall be as indicated. Ends of pilings to be spliced shall be squared before splicing to eliminate dips or camber. Pilings shall be spliced together with

concentric alignment of the interlocks so that there are no discontinuities, dips or camber at the abutting interlocks. Spliced pilings shall be free sliding and able to obtain the maximum swing with contiguous pilings. The tops of pilings excessively battered during driving shall be trimmed when directed at no cost to the Government. Piling cut-offs shall become the property of the Contractor and shall be removed from the site. The Contractor shall cut holes in pilings for bolts, rods, drains or utilities as shown or as directed. All cutting shall be done in a neat and workmanlike manner. A straight edge shall be used in cuts made by burning to avoid abrupt nicks. Bolt holes in steel piling shall be drilled or may be burned and reamed by approved methods which will not damage the surrounding metal. Holes other than bolt holes shall be reasonably smooth and the proper size for rods and other items to be inserted.

#### 3.1.4 Inspection of Driven Piling

The Contractor shall inspect the interlocked joints of driven pilings extending above ground. Pilings found to be out of interlock shall be removed and replaced at the Contractor's expense.

#### 3.1.5 Pulling and Redriving

In the pulling and redriving of piles as directed, the Contractor shall pull selected pilings after driving to determine the condition of the underground portions of pilings. Any piling so pulled and found to be damaged to the extent that its usefulness in the structure is impaired shall be removed and replaced at the Contractor's expense. Pilings pulled and found to be in satisfactory condition shall be redriven when directed.

-- End of Section --

## SECTION 02490

## PLANTING

Item No. 16 - 5 inch Topsoil and Seeding

Item No. 54 - Landscaping

## PART 1 GENERAL

## 1.1 SCOPE

Under this Item, the Contractor shall excavate all plant pits and furnish, plant, maintain, and replace all PLANT MATERIAL specified in the following plant schedule, in accordance with the plans and specifications, or as directed by the Construction Officer.

The Contractor shall be liable for any damages to property caused by planting operations, and all areas and construction disturbed shall be restored to their original conditions, to the satisfaction of the Construction Officer.

## 1.2 GENERAL

## 1.2.1 Bidders Experience

Bidders shall have successfully completed a minimum of five projects, each over 1 acre in size, during the past five years. The Bidder will have demonstrated experience in planting native vegetation and native meadows. The Bidder should submit a description of five projects for review by the Government. See paragraph entitled Transplanting Plant Material for additional qualifications.

## 1.2.2 Plant Names

Plant names, size, and grading standards shall conform to those prepared by the American Association of Nurserymen Horticultural Standards, 1995 Edition, unless otherwise specified. No substitution shall be permitted, except with the written permission of the Construction Officer and the approval of the Design Division. All plant materials delivered to the site shall be labeled.

## 1.3 SUBMITTALS

## 1.3.1 Qualifications of Landscape Planting Contractor

Within thirty days of the award of the contract, the Contractor shall forward in writing the name and qualifications of the Sub/Contractor to complete the landscape planting work. The Contractor will submit a complete list of the genetic origin of the plant materials to the Construction Officer for review.

### 1.3.2 Acquisition of Plant Materials

Any problems with obtaining any of the specified plant materials should be forwarded in writing to the Construction Officer. The cause of the acquisition problem(s) shall be discussed in full and a list of vendors contacted shall be included. The Contractor should be aware that more than one vendor may be required to obtain all the necessary plant materials. Suggestions concerning appropriate substitutions may be included with the correspondence for review.

### 1.3.3 Purchase Orders

The contractor shall furnish all plant materials purchase orders to the Construction Officer a minimum of sixty days prior to plant material arrival on site. Only after receiving written approval of the genetic origin of the source material by the Construction Officer shall the Contractor initiate procurement of the source.

### 1.3.4 Field Stockpiling Site Plan

A minimum of sixty days prior to the initiation of planting operations, the Contractor shall supply the Contracting Officer with a map indicating the location of each of the proposed field stockpiling (field caches). The base map shall be provided by the Government. The number and locations of the field stockpiling sites shall be developed in such a manner as to promote an efficient planting operation. This field stockpiling site plan shall be subject to approval by the Construction Officer, and whenever directed by the Construction Officer, additional stockpiling areas shall be prepared by the Contractor at the locations selected by the Contracting Officer at no additional cost to the Government.

### 1.3.5 Plant Propagation Guidelines

Any proposed variance from the plant propagation guidelines shall be approved in writing by the Construction Officer prior to initiating the change(s). Upon request by the Construction Officer, the Contractor shall supply a complete methodology concerning the proposed or completed collection and propagation methods including dates of collection, collection statistics, method of collection, growth media, cell sizes, rooting treatments and recommendations concerning future propagation methods including pruning, fertilizer treatments and recommendations concerning future propagation methods. The Construction Officer shall inform the plant material suppliers of these requirements prior to obtaining any purchase order agreements.

### 1.3.6 Proposed Layout Plan

The Contractor shall submit a proposed layout plan to the Construction Officer sixty days prior to the planting, shall be clearly marked and documented. A list of quantities of each species installed in each species installed in each of the planting blocks or areas shall be submitted with the plan.

#### 1.4 QUALITY AND INSPECTIONS

##### 1.4.1 Quality

All plants shall be typical of their species or variety. They shall have normal, well-developed branches and vigorous fibrous root systems. They shall be sound, healthy, vigorous plants free from defects, disfiguring knots, sun scald injuries, dead or broken branches, abrasions of the bark, plant diseases, insect eggs, borers, and all forms of infestation. The Construction Officer will tag for rejection all plant material that does not meet the above specifications, and trees having damaged or missing leaders, multiple leaders, Y-crotches, or indications of topping or heading back.

All plants shall be nursery-grown, unless otherwise stated. All trees and shrubs shall have been growing under similar climatic conditions as the project site two (2) years prior to the date of the contract. Plants held in storage will be rejected if they show signs of growth during storage. Collected plants shall be taken from a soil favorable to good root development. All collected material shall be clean sound stock, free from decaying stumps.

Herbaceous plants, vines, and groundcover shall be vigorous healthy plants, a minimum two (2) years old, from cuttings, seed, or division, with well-developed root systems and crowns, as specified in the Plant Schedule.

Bulbs shall be firm, non-desiccated, and certified free of disease and viral infection, of the sizes, grades, and varieties indicated in the Plant Schedule.

##### 1.4.2 Inspections

The Contractor shall be responsible for all certificates of inspection of plants that may be required by federal, state, or other authorities to accompany shipments of plants, and such certificates shall be filed with the Construction Officer prior to acceptance of the materials.

###### 1.4.2.1 Quality Control Record

The Contractor shall submit a Quality Control Record which should include at a minimum:

1. Inspection/Rejection of Plant Material,
2. Results of all soil testing and resulting soil amendment activities,
3. All replacements or substitutions of plant materials,
4. Record of watering and mulching activities,
5. Record of herbivory measures.

##### 1.4.3 Acceptance

The plant material shall be evaluated for acceptance thirty (30) days after all the following have been completed or satisfied:

1. The plant material has been satisfactorily installed.

2. All specified fencing has been installed and accepted adjacent to the planting areas.

No compensation shall be made for the installation or the cost of the material for plants not properly planted, including those plants whose roots are exposed at the time of acceptance. During the acceptance period, the Contractor shall be responsible for ensuring that the planting areas are kept moist. Plant materials determined to be dead or seriously weakened shall not be accepted.

#### 1.4.4 Guarantee Period

The Contractor shall replace, in accordance with the contract plans and specifications, any plant material that is dead or, in the opinion of the Construction Officer, in an unhealthy or unsightly condition, and/or have lost their natural shape due to dead branches, excessive pruning, inadequate or improper maintenance, or other causes, including vandalism, prior to final acceptance, in the next planting season. There shall be a two (2) year guarantee on plant material commencing after the final acceptance and the completion of the whole work of this contract. When instructed by the Construction Officer, plant material that has died after final acceptance shall be replaced in the next appropriate planting season, even when the next planting season falls outside the two year period. Plant material that dies within the two (2) year guarantee period shall be replaced as many times as necessary to achieve a minimum of 95% of the original plant quantity during the first inspection year, and 85% of the original plant quantity during the second year, in accordance with industry standards and NJDEP permit requirements. The cost of replacements(s) shall be included in the unit price bid for the various furnished items of the contract. Survival rate inspection will be conducted by the Construction Officer.

Where vandalism or related causes are agreed by the Construction Officer as the cause for plant material replacement, the Contractor shall not be responsible for replacement during the two-year guarantee period after final acceptance.

Where dead plant material has been identified, whether due to natural causes or vandalism, the Contractor shall remove the dead material, including stakes, and wire (if applicable) within three (3) weeks of notification

Where dead plant material has been identified, whether due to natural causes or vandalism, the Contractor shall remove the dead plant material, including stakes, burlap, tree irrigation bags, if any, and wire. Earth will be leveled and new topsoil and seed, or appropriate paving material, added at the direction of the Construction Officer to eliminate any hazardous conditions.

#### 1.4.5 Final Inspection Reports

The Contractor shall include findings of the annual inspection in a Quality Control Report. Results of the inspections shall include, but not be limited to photographs of dead/dying plants to be replaced, clear



identification on drawings of location of said plants, notes on probable cause of damage or ill-health, photograph of replacement planting(s) and additional protective measures, if taken. All replanting shall be done at no additional cost to the Government. Replants shall be in accordance with plans and specifications. The Contractor will provide the Construction Officer with a replanting schedule based on guarantee inspections.

#### 1.5 MEASUREMENT AND PAYMENT

The quantity of PLANT MATERIAL to be paid for under these Items shall be the number of trees, shrubs, vines, herbaceous plants, groundcovers, and bulbs of each size planted and maintained, in accordance with the plans and specifications, to the satisfaction of the Construction Officer.

The price bid shall be a unit price per EACH tree, shrub, vine, herbaceous plant, groundcover, or bulb of each size, as specified in the Plant Schedule, and shall include the cost of furnishing plants, mycorrhizal inoculant, slow-release fertilizer tablets, water retention additive, shredded bark mulch for tree pits, shrub beds, and perennial or groundcover beds, and irrigation bags (for trees), inspecting, planting, staking, anchoring, watering, replacing, and maintaining all plant material and all work incidental thereto, in accordance with the plans and specifications, to the satisfaction of the Construction Officer. The price of water, regardless of source, is deemed included in the unit price bid. No extra payment will be made for water coming from the Contractor's own source.

The cost, including all equipment, materials and labor required to install and maintain the Transplantation of Existing Plant Material, the seeding of lawn mix and native grass mix in the specified zones shall be included in one lump sum cost stated on the proposal.

### PART 2 PRODUCTS

#### 2.1 PLANT SOURCES FOR NATIVE PLANTS ONLY, WHERE APPLICABLE

Native plant material must be derived from the local genotypes of the native Plants specified. For purposes of this native plant material paragraph, "local" shall mean within 150 miles from the planting site. However, a reasonable effort shall be made to obtain sources of plant material as close to the planting site as possible. All plants must have been grown in a hardiness zone no warmer than Zone 7 or colder than Zone 6 as determined by the USDA Agricultural Research Service, Plant Hardiness Zone Map. Plant quality shall be typical of their species. Plant material should exhibit the range of variation typical of local genotypes of the species as determined by the Construction Officer. They shall have normal branching and vigorous fibrous root systems. They shall be sound, healthy plants, free from sunscald injuries, or other mechanical injury, plant diseases, insect eggs, borers and all forms of infestations. All plants shall be nursery grown unless otherwise stated. Collected material will not be accepted. Except as may otherwise be specified in this native plant material paragraph, all other sections of this Plant Material specification shall also apply to the Native Plants. The native plant material, subject to availability and adherence to the requirements of this paragraph, may be purchased from the following nurseries or approved equal nurseries as

determined by the Construction Officer:

Greenbelt Native Plant Center, Staten Island, NY

Pineland's Nursery, Columbus, NJ

Wild Earth, Freehold, NJ

Sylva Native, New Freedom, PA

Ernst Conservation Seeds, Meadville, PA

## 2.2 DIMENSIONS

A plant shall be dimensioned as it stands in its natural position. Trees up to and including four-inch (4") caliper size shall be measured six inches (6") above ground level. Trees over four inches (4") in caliper size shall be measured twelve inches (12") above ground level. Stock furnished shall be a fair average of the minimum and maximum sizes specified. Larger plants cut back to sizes specified will not be accepted.

Container grown herbaceous plants, groundcover, and vines shall be well rooted in the container size indicated on the Plant Schedule, grown in the container at least one year prior to planting. Bulbs shall be Top Size, or as indicated on the Plant Schedule. Annual flowering plants shall be vigorous, well rooted, with no indications of disease or stress.

## 2.3 PREPARATION OF PLANTS

All precautions customary in good trade practice shall be taken in preparing plants for moving. Workmanship that fails to meet the highest standards will be rejected. All plants shall be dug immediately before moving unless otherwise specified. All plants shall be dug to retain as many fibrous roots as possible. Balled and burlapped and balled and platformed plants shall have a solid ball of earth of minimum specified size, securely held in place by burlap and stout rope or twine. Oversized or exceptionally heavy plants are acceptable if the size of the ball or spread of roots is proportionately increased, to the satisfaction of the Construction Officer. Loose, broken, or manufactured balls will be rejected. Bare root plants shall be puddled immediately after digging by immersing the roots in a thick mixture of clay and water so as to completely coat the roots with clay.

## 2.4 DELIVERY

Plants shall be packed, transported, and handled with utmost care to insure adequate protection against injury. When transported in closed vehicles, plants shall receive adequate ventilation to prevent sweating. When transported in open vehicles, plants shall be protected by tarpaulins or other suitable cover material. All bare root plants shall be adequately protected from drying out and immediately after inspection shall be heeled in moist soil. Balled and burlapped plants shall be set on the ground and the ball covered with soil. Until planted, all material shall be properly maintained and kept adequately moist, to the satisfaction of the

Construction Officer.

No later than 45 days prior to estimated planting date, the Contractor shall submit and Estimated Planting Schedule. Notice shall be given to the Construction Officer not less than 72 hours before the plant material is to be on the project site. Inspections of the plant materials, including root systems, may be made by the Construction Officer. All dormant plant materials shall be installed within 48 hours and all non-dormant plants shall be installed within 36 hours. Shipments of plants may be staggered over several days.

## 2.5 PLANT SCHEDULE

### ABBREVIATIONS

B & B Indicates tree or shrub to be balled and burlapped.  
 Cont. Container plant  
 O.C. Indicates "on center" or spacing between plants in all directions.  
 Ht. Indicates overall height of tree.

TREES: All trees shall be B&B, major trees branched 6-7' from the ground, minor trees as specified. Sizes shall be as indicated. Rootball size shall correspond to American Association of Nurserymen Standards for the corresponding caliper size. Well-branched top and fibrous root system essential.

SHRUBS: Sizes shall be as indicated. Rootball or container sizes shall correspond to A.A.N. Standards for the corresponding shrub height. Heavy root system, all shrubs shall be well branched to the ground. Sizes shall be as indicated.

VINES, GROUNDCOVER, AND HERBACEOUS PLANTS: Container size shall be as indicate on the plans. All plants shall have vigorous root systems and have grown in the container for at least one year prior to planting.

Quantity	Botanical name	Common name	Notes	O.C.
7	<i>Acer rubrum</i>	Red maple	>4' Ht., cont. or B&B	15
3	<i>Acer saccharinum</i>	Silver maple	>4' Ht., cont. or B&B	15
2	<i>Amelanchier canadensis</i>	Serviceberry	>4', cont or B&B	15
42	<i>Aronia arbutifolia</i>	Red chokeberry	18"-24", cont. plant	
3	<i>Betula nigra</i>	River birch	>4", cont. or B&B	15
3	<i>Buddleia davidii</i>	Orange-eye butterflybush	18"-24", cont. plant	
6	<i>Campsis radicans</i>	Trumpetcreeper	cont. plant, V	2
171	<i>Ceanothus americanus</i>	New Jersey tea	18"-24", cont. plant	3
7	<i>Cercis canadensis</i>	Eastern redbud	>4', cont. or B&B	15
26	<i>Cornus amomum</i>	Silky dogwood	2' - 4', cont. plant	6
28	<i>Cornus sericea</i>	Red-osier dogwood	18"-24", cont. plant	5
15	<i>Forsythia intermedia</i>	Border forsythia	18"-24", cont. plant	5
5	<i>Fraxinus americana</i>	White ash	4' and up, cont. or B&B	15

3	Hamamelis virginiana	American witchhazel	2'-4', cont. or B&B	12
12	Hedera helix	English ivy	cont. plant, V	2
10	Hydrangea anomala subsp. Petiolaris	Climbing hydrangea	cont. plant, V	2
2	Ilex opaca	American holly	2'-4', cont.	15
29	Ilex verticillata	Common winterberry	18"-24", cont. plant	6
8	Lindera benzoin	Spicebush	18"-24", cont. plant or B&B	12
2	Pinus nigra	Austrian pine	>5', high	15
21	Rhododendron catawbiense	Catawba rhododendron	18"-24", cont. plant, DF	6
84	Salix discolor	Pussy willow	18"-24", cont. plant	6
65	Spirea alba	Meadowsweet	18"-24", cont. plant	3
52	Spirea tomentosa	Steeplebush spirea	18"-24", cont. plant	3
13	Symphoricarpus albus	Common snowberry	18"-24", cont. plant	4
15	Vaccinium corymbosum	Highbush blueberry	18"-24", cont. plant	6
76	Viburnum dentatum	Arrowwood	18"-24", cont. plant	6
5	Viburnum lentago	Nannyberry	18"-24", cont. plant	10
69	Viburnum opulus L. var americanum	American cranberrybush	18"-24", cont. plant	6
5	Ait 'Compactum' Viburnum setigerum	Tea viburnum	18"-24" cont. plant	10

For Seeding Plant Schedule, See Sections 02490-17 and 02490-18 LAWN MIX AND NATIVE GRASS MIX.

### PART 3 EXECUTION

#### 3.1 PLANTING OPERATIONS

##### 3.1.1 Time of Planting

Unless otherwise directed by the Construction Officer, deciduous material shall be planted from March 1st to May 1st and from October 15th to December 15th. Evergreen material shall be planted from April 1st to May 15th and from September 1st to October 15th, or as approved by the Construction Officer.

##### 3.1.2 Location

Site characteristics, such as overhead power lines, existing vegetation, and infrastructure items, such as curbs and sidewalks, shall be considered. Trees that grow taller than thirty feet (30') should not be planted directly under power lines. When the design allows, the tree leader shall be offset from power lines.

##### 3.1.3 Excavation of Plant Pits

Sizes of plant pits shall be as shown on the planting plan. Planting soil

shall be unamended existing soil excavated from the planting pit, unless amendments or topsoil are specified elsewhere in the contract. When subsurface obstructions are encountered during excavation, the Contractor shall restore the disturbed area to its original condition.

When planting in Structural Soil and the depth of the rootball exceeds the depth to the filter fabric underlying the Structural Soil installation, the Contractor shall score the filter fabric in an 'X' and excavate sufficiently to permit the top of the ball to rest at finished grade. All plant material in all planting applications should be checked to ensure the crown hasn't been buried during containerization or balling and burlapping. If so, the additional soil should be removed and the plant set at the correct finished grade.

Each tree shall be planted in an individual pit as specified. Pits for balled and burlapped material shall be dug three (3) times the size of the root ball in diameter and only deep enough so that the root ball sits on undisturbed subgrade, except in situations where curbs and/or adjacent pavements prevent achievement of planting pit dimensions. Sizes of restricted planting pits (i.e. street trees) shall be at the maximum width allowed, and the same depth as the root ball being planted. Any changes in the planting pit sizes shall be broad enough to accommodate the roots fully extended and only deep enough so that the uppermost roots will be just below the original grade.

No plant pits shall be dug until the proposed locations have been staked on the ground by the Contractor and approved by the Construction Officer. No plant pits shall be backfilled until planting is approved by the Construction Officer. All pits shall have vertical sides unless otherwise directed. Excavated material, when found to be unsuitable, shall be removed from the site and replaced with topsoil, as directed by the Construction Officer.

Extreme care shall be taken not to excavate to a depth greater than required. The subgrade below the root ball shall be tamped slightly to prevent settlement. Where, in the opinion of the Construction Officer, the subgrade material is unsuitable, the size of the plant pits shall be dug one-half (1/2) wider than normally required. The bottom and sides of the pit shall be backfilled with the existing soil, without amendments, and thoroughly worked into place to remove air pockets/voids.

**Mycorrhizal Fungi Inoculant:** Shall be applied by means of a three ounce (3 oz.) premeasured dry formulation packet, such as Mycor Tree Saver Transplant®, as manufactured by Plant Health Care, Inc., Pittsburgh, PA. Rhizanova Tree Transplant, as manufactured by Becker Underwood, Inc., Ames, IA, or approved equal. Packets shall contain, as a minimum: one thousand (1000) live spores of Vesicular-Arbuscular fungi, including: *Entrophospora columbiana*, *Glomus clarum*, *Glomus etunicatum*, and *Glomus sp.*; seventeen million five hundred thousand (17,500,000) live spores of Ectomycorrhizal fungi (*Pisolithus tinctorius*); Biostimulant ingredients including *Yucca schidigera* extract; soluble sea kelp extract derived from *Ascophylum nodosum*; humic acids; and acrylamide copolymer gel as a water absorbent medium. Mycorrhizal fungi inoculant shall be added to the top six to eight inches (6-8") of backfill soil in each planting pit and thoroughly mixed to

distribute the inoculant. The material shall be applied according to the following chart:

Size of rootball or container	Ounces per plant
1 gallon	1
2 gal.	2
3 gal.	3
5 gal.	3
7 gal.	3
10 gal.	3
15 gal.	3
20" B&B	6
24" B&B	9
30" B&B	9
36" B&B	12
12" B&B	12

#### 3.1.4 Fertilizer Tablets

Shall be Healthy Start Macro Tablets®, as manufactured by Plant Health Care, Inc., Pittsburgh, PA, or approved equal. The tablets shall have a nutrient analysis of 12-8-8 and contain a minimum twelve percent (12%) humic acid by weight, as well as biostimulants derived from sea kelp, amino acids, and a wetting agent derived from Yucca schidigera. Tablets shall contain a minimum 695,000 each of the following beneficial bacteria: nitrogen fixing, phosphorus solubilizing, and growth promoting. Twenty one-gram (21-gm.) twenty four-month (24 mo.) release tablets shall be added to the top four inches (4") of backfilled soil in the rates indicated on the following chart:

Size of rootball or container	Tablets per plant
1 gallon	1
2 gal.	2
3 gal.	2
5 gal.	3
7 gal.	3
10 gal.	4
15 gal.	5
20-24" B&B	5
30-36" B&B	6
42-48" B&B	7

#### 3.1.5 Water Retention Additive

Water Retention Additives shall be a granular polyacrylamide polymer of a potassium base and not a sodium base that slowly releases moisture into the root zone such as Terra Sorb, as manufactured by Plant Health Care, Inc., 440 William Pitt Way, Pittsburgh, Pa., or approved equal. It shall be applied at the time of planting during a dry planting as defined by Parks and Recreation. When planting trees, each tree shall receive three (3) ounces or amount specified by product instructions. Half should be added at a depth of 8-10 inches and the other half just below the finished surface.

When planting shrubs, perennials or annuals, the product should be applied as per product instructions.

#### 3.1.6 Tree Irrigation Bags

When planting trees, the Contractor shall provide irrigation bags and fill them so as to provide a minimum one inch (1") rainfall equivalent per week after the initial planting saturation. The irrigation bags shall be one hundred percent (100%) reinforced UV stable polyethylene, at least ten (10) mils. thick with a polyester scrim lining, such as TreeGator, as manufactured by Spectrum Products, Raleigh, NC, or approved equal. The irrigation bags shall have a minimum twenty-gallon (20 gal.) capacity, and the Contractor shall fill the bags to capacity at least once per week during the contract period. The bags shall be installed with two (2) holes open to provide a drip time of six to ten hours (6-10 hrs.).

#### 3.1.7 Range Fence

When planting trees in lawn areas, the Contractor shall provide range fencing, in an area approximately five feet (5') square, in order to protect the trees from lawn mowers and trimmers.

#### 3.1.8 Deer Fence

Deer fencing shall be used as indicated on plans. Deer fencing shall be a minimum height of 7' with mesh of 5/8"x 3/4". Spacing of fence posts shall be no greater than 10 feet apart.

#### 3.1.9 Tomato Caging

Tomato caging will be used around vine plantings to prevent maintainer from mowing plant prior to its establishment on the concrete wall

#### 3.1.10 Planting Conditions

The Construction Officer may stop planting due to weather or any other conditions that are not favorable to planting. Unsatisfactory planting conditions include, but are not limited to, temperature above 75 Farenheit, relative humidity below 40%, wind speed greater than 12 miles/hour, or available soil moisture less than 50%. Planting may also be postponed if ground freezing temperatures are forecasted for several days immediately following the planting.

#### 3.1.11 Clean Up of Site

At the end of each day's work, the Contractor shall remove all trash and other debris resulting from his work from the site. At all times, rubbish and trash generated from the Contractor shall be kept clear of vehicular circulation throughout the site. All drains on site which have accumulated soil, mulch or any other material due to the planting operation, shall be cleaned.

### 3.2 PLANTING

Planting shall be performed by an approved Contractor. No planting shall be done except in the presence of the Construction Officer. All material shall be inspected by the Construction Officer as it is removed from the truck, prior to placing in an approved storage area or the designated planting site. All rejected material shall be removed from the site and replaced with acceptable material at no additional cost to the City.

Bare root material shall be adequately protected from drying out and immediately heeled in after inspection. The bundles of heeled-in plants shall be set upright on the ground, covered with mulch, and kept adequately moist until the time of installation. Until the time of planting, all plant material shall be stored in an approved location, securely fenced and maintained, to the satisfaction of the Construction Officer, at no additional cost to the City. All plants not planted immediately shall be watered as necessary to maintain optimal health until planting.

Place balled and burlapped material in the prepared planting pit by lifting, and carry it by the rootball. Set the tree or shrub straight and in the center of the pit, with the most desirable side facing toward the predominant view. All material shall set, after settlement, at the same level at which they have grown in the nursery. Care shall be exercised in setting the plants plumb. All ropes, stones, etc. shall be removed from the pit before backfilling. Soil for backfill shall be loose and friable and not frozen or compacted.

Cut and remove rope or wire from the top fifty percent (50%) of the rootball and pull the burlap back to the edge of the ball. Remove as much woven product and twine as possible. All plastic or synthetic fabric must be removed from the ball at the time of planting. Any wire basket enclosed root ball will need to have at least two-thirds (2/3) of the wire basket cut away from the sides and top of the ball and removed. Remaining lateral wires must be cut to prevent future root interference. Wire must not be galvanized or aluminum wire.

Balled and burlapped plants shall be handled so that the ball will not be loosened. After the soil has been thoroughly firmed under and around the ball, the burlap shall be cut away from the upper half of the ball, and the remaining burlap adjusted to prevent the formation of air pockets. Where directed by the Construction Officer, the burlap shall be entirely removed. Soil shall be firmed at six to eight inch (6-8") intervals and thoroughly settled with water. Plants with exposed roots shall be placed in the proper position in the center of the pit after the soil in the bottom of the pit has been firmed. Roots shall be arranged in their natural position and existing soil worked in among them, firmed at intervals, and mycorrhizal inoculant, fertilizer tablets and water retention additive worked into the top eight inches (8") of backfill soil in the correct proportions. The plants shall then be thoroughly settled in with water. Care shall be taken to avoid bruising or breaking the roots when tamping the soil. All large and fleshy roots that are bruised or broken shall be pruned, making a clean cut before planting.

Vines, Herbaceous, and Groundcover plants shall be carefully removed from containers or flats immediately prior to planting and set to the same depths as they were grown in the nursery bed or container, to the correct



spacing indicated on the plans. Roots shall be arranged in their natural position and topsoil worked in among them, taking care to avoid bruising or damaging the roots, and fertilizer tablets added to the top four inches (4") of backfill soil in the correct proportion for the respective pot size. No later than one hour after planting, all plants shall be thoroughly settled in with water.

Bulbs shall be planted in the locations indicated on the plans and to the depths and spacing indicated on the Plant Schedule. Bulbs shall be planted in late September or October, no more than six (6) weeks before frost. Prior to planting, bulbs shall be stored in a cool, dry, well-ventilated location for no longer than two (2) weeks before planting.

### 3.3 FINISHING SURFACE AFTER BACKFILLING

The Contractor shall cultivate and rake over finished planting areas and shall leave the site in an orderly condition. On level ground or slight slopes, a shallow basin a little larger than the diameter of the plant pit shall be left around each plant, as shown on the plans, or as directed by the Construction Officer. On steep slopes, the soil on the lower side of the plant shall be graded in such a manner that it will catch and hold water, as shown on the plans, or as directed by the Construction Officer. Upon completion of planting, all debris and waste material resulting from the planting operation shall be removed from the project area, and the affected area raked and cleaned as necessary.

All work done in preparing shallow basins or grading of plant pits on steep slopes and regrading and reseeding of plant saucers shall be deemed included in the unit price per plant. All berms raised for shallow basins in level or gently sloping grass areas shall be removed at the end of the guarantee period, as well as tree stakes and irrigation bags, if present. This topsoil shall be cast evenly over the surrounding grass areas and grass seed sown over the removed berms.

After the shallow tree basins and plant saucers and shrub beds have been prepared, they shall be mulched, three to four inches (3-4") in depth, inside and along the outside edge of the basins/saucers. Perennial beds shall be mulched to a two inch (2") depth. Mulch shall consist of shredded bark not exceeding three inches (3") in length and one inch (1") in width. Mulch contaminated with leaves, twigs, and/or debris shall not be acceptable. Only mulch derived from tree material, not from wood waste products like sawdust, shall be acceptable. Mulch for tree pits and shrub and/ or perennial beds shall be included in the bid price. After placing mulch on tree pits, the tree irrigation bags shall be installed and filled as per manufacturer's recommendations. Tree irrigation bags shall be included in the unit prices bid for the various Contract Items.

### 3.4 STAKING

All staking shall be done immediately after planting and all stakes and wire shall be maintained. Plants shall stand plumb after staking. Stakes shall be of white cedar with bark attached. They may have a maximum allowable deflection of ten percent (10%). Stakes of the dimensions shown on the plans and details shall be placed outside the root ball and shall be

driven to the depths indicated on the plans and details. Stakes shall be fastened to the tree with double No. 12 gauge annealed galvanized steel wire run through a suitable length of new reinforced one-half inch (1/2") rubber hose. Stakes shall be set parallel to the contours, curbs, or walks, unless otherwise directed by the Construction Officer. Stakes, wires, hoses and tree irrigation bags shall be removed by the Contractor at the end of the guarantee period and shall become their property.

### 3.5 PRUNING

Broken or badly bruised branches shall be removed with a clean cut. Do not cut leaders or use wound paint or dressing to treat cut areas. Crossed branches shall be pruned with a sharp tool in such a manner as to preserve and encourage the plant's natural growth form. The crowns of young trees should not be cut back to compensate for root loss.

### 3.6 MAINTENANCE

At the time of planting, the soil around each plant shall be thoroughly saturated with water, and as many times later as seasonable conditions require, until final acceptance of the plant materials. If local sources are not available, the Contractor shall provide a water source. Maintenance shall include watering, including filling tree irrigation bags to capacity at least once per week, weeding, cultivating, edging, control of insects, fungal infections, and other diseases by means of spraying with an approved insecticide or fungicide, pruning, adjustment and repair of stakes, anchors, and wires, repair of minor washouts and gullies up to twelve inches (12") in depth, and other horticultural operations necessary for the proper growth of all trees, as well as replacement of plants stolen or vandalized prior to the Final Inspection, to a degree judged sufficient for replacement by the Construction Officer. The Contractor shall also be responsible for keeping the entire area within the contract limits neat in appearance until the final acceptance and completion of the whole work of this contract.

### 3.7 TRANSPLANTING PLANT MATERIAL

#### 3.7.1 Work

Under these Items, the Contractor shall TRANSPLANT PLANT MATERIAL as delineated on the plans and maintain and replace all plant material specified in the following Plant Schedule, in accordance with the plans, specifications, and directions of the Construction Officer. All plant material shall be selected and tagged by the Construction Officer from existing plant material on the site.

This work is to be done only by a Sub/Contractor specializing in tree moving and tree services. The Sub/Contractor will have a minimum of two years demonstrated experience in moving large caliper trees. C.J. Excavating and Tree Moving, Bloomsbury, NJ; Torsilieri, Inc., Gladstone, NJ; Trees Now Inc., Upper Saddle River, NJ or other qualified tree service company will be used for transplantation of plant material.

The Contractor shall be liable for any damages to property by transplanting

operations and all areas and construction disturbed shall be restored to their original condition, to the satisfaction of the Construction Officer.

### 3.7.2 Submittals

The Contractor shall submit within thirty days of the award of the contract, the name and qualifications of the Sub/Contractor who will be selected for transplantation of plant materials. The qualifications must include a description of project history, available tree moving equipment and staff qualifications.

### 3.7.3 Materials

Plants: Plants shall be as shown on the plans.

Burlap for Root Ball: Burlap shall be a natural fabric. No nylon burlap shall be permitted.

Cord or Rope: Cord or rope shall be sisal twine. Nylon rope shall not be permitted.

Mycorrhizal Fungi Inoculant: Shall be applied by means of a three ounce (3 oz.) premeasured dry formulation packet, such as Mycor Tree Saver Transplant®, as manufactured by Plant Health Care, Inc., Pittsburgh, PA; Rhizanova Tree Transplant, as manufactured by Becker Underwood, Inc., Ames, IA; or approved equal. Packets shall contain, as a minimum: one thousand (1000) live spores of Vesicular-Arbuscular fungi, including: *Entrophosphora columbiana*, *Glomus clarum*, *Glomus etunicatum*, and *Glomus sp.*; seventeen million five hundred thousand (17,500,000) live spores of Ectomycorrhizal fungi (*Pisolithus tinctorius*); Biostimulant ingredients including *Yucca schidigera* extract; soluble sea kelp extract derived from *Ascophylum nodosum*; humic acids; and acrylamide copolymer gel as a water absorbent medium. Mycorrhizal fungi inoculant shall be added to the top six to eight inches (6-8") of backfill soil in each planting pit and thoroughly mixed to distribute the inoculant. The material shall be applied according to the following chart:

Size of rootball or container	Ounces per plant
20" B&B	6
24" B&B	9
30" B&B	9
36" B&B	12
42" B&B	12
48" B&B	15
60" B&B	18
72" B&B	21
96" B&B	27

Fertilizer Tablets: Shall be Healthy Start Macro Tablets®, as manufactured by Plant Health Care, Inc., Pittsburgh, PA, or approved equal. The tablets shall have a nutrient analysis of 12-8-8 and contain a minimum twelve percent (12%) humic acid by weight, as well as biostimulants derived from sea kelp, amino acids, and a wetting agent derived from *Yucca*

schidigera. Tablets shall contain a minimum 650,000 each of the following beneficial bacteria: nitrogen fixing, phosphorus solubilizing, and growth promoting. Twenty one gram (21 gm.) twenty four month (24 mo.) release tablets shall be added to the top four inches (4") of backfilled soil in the rates indicated on the following chart:

Size of rootball or container	Tablets per plant
20-24" B&B	5
30-36" B&B	6
42-48" B&B	8
54-60" B&B	12

For larger trees, use two (2) tablets for each one-half inch (1/2") caliper.

Water Retention Additive: Water Retention Additives shall be a granular polyacrylamide polymer of a potassium base and not a sodium base that slowly releases moisture into the root zone such as Terra Sorb, as manufactured by Plant Health Care, Inc., 440 William Pitt Way, Pittsburgh, Pa., or approved equal. It shall be applied at the time of planting during a dry planting. When planting trees, each tree shall receive three (3) ounces or amount specified by product instructions. Half should be added at a depth of 8-10 inches and the other half just below the finished surface. When planting shrubs, perennials or annuals apply as per product instructions.

#### 3.7.4 Execution

Preparation of Plants: All precautions customary in good trade practice shall be taken in preparing plants for moving, and workmanship that fails to meet the highest standards will be rejected. All plants shall be dug immediately before moving unless otherwise directed. All plants shall be dug to retain as many fibrous roots as possible. Balled and burlapped plants shall have a solid ball of earth of minimum specified size according to the American Standard for Nursery Stock securely held in place by burlap and sisal twine. Root balls under fourteen inches (14") in diameter may be laced with two (2) ply sisal and root balls fourteen inches (14") and over shall be laced with three (3) ply sisal. Root balls that are fourteen inches (14") in diameter and over require Drum Lacing and shall be inspected by the Construction Officer before moving. Loose, broken, and wire caged balls will be rejected. All rejected material shall be immediately removed from the site and replaced with acceptable material at no additional cost.

Bare root plants shall conform to the same standards for balled and burlapped plant material and shall be adequately protected from drying out and immediately heeled in moist soil until planting.

Time of Planting and Transplanting: Unless otherwise directed by the Construction Officer, evergreen material shall be transplanted from April 1st to May 1st, and from September 1st to October 15th. Deciduous material shall be transplanted from March 1st to May 1st and from October 15th to December 1st.

Excavation of Planting Pits: Sizes of planting pits shall be as shown on the plans. Transplanted shrubs shall be planted in existing topsoil in plant beds as shown on drawing. The Contractor shall set aside the excavated soil and backfill with the unamended native soil. Where, in the opinion of the Construction Officer, the subgrade material is unsuitable, it shall be replaced with adequate subgrade material and topsoil. No plant pits shall be dug until the proposed locations have been staked on the ground by the Contractor and approved by the Construction Officer. No plant pits shall be backfilled until approved by the Construction Officer and all pits shall have vertical sides unless otherwise directed.

Where excavation is done by backhoe (or any comparable machine) extreme care shall be taken not to excavate too deeply. This will insure the least amount of settling, which is important to achieve a proper planting grade. If planting pits are dug before plant material is on site, the pits shall only be excavated to two-thirds (2/3) the depth of a standard pit, the final depth to be adjusted at the time of planting. If any backfilling is required, the soil under the root ball is to be compacted sufficiently to ensure no further settling or sinking.

Planting: No transplanting shall be done except in the presence of the Construction Officer. While plants with exposed roots are being distributed in planting beds or are awaiting planting after distribution, the Contractor shall protect the roots from drying out and the means employed shall be satisfactory to the Construction Officer. In general, all plants shall stand, after settlement, at the same level at which they have grown. Care shall be exercised in setting the plants plumb with the "good face" to the outside. All ropes, stones, etc., shall be removed from the pit before backfilling. Soil for backfilling shall be loose and friable.

Balled and burlapped plants shall be handled so that the ball will not be loosened or broken. After the soil has been thoroughly firmed under and around the lower half of the ball, the burlap shall be cut away from upper half of the ball and the remaining burlap adjusted to prevent the formation of air pockets. Soil shall be firmed at six (6") to eight inch (8") intervals and thoroughly settled with water the same day of planting.

Bare root plants shall be placed in the proper position in the center of the pit after the soil in the bottom of the pit has been firmed. Roots shall be arranged in their natural position and loose friable topsoil worked in among them, firmed at intervals and thoroughly settled with water. Care shall be taken to avoid bruising or breaking the roots when tamping the soil. All large and fleshy roots which are bruised or broken shall be pruned with a clean cut before planting.

Finishing Surface After Backfilling: The Contractor shall cultivate and rake over finished planting areas and shall leave them in an orderly condition. On level ground or slight slopes a shallow basin a little larger than the diameter of the plant pit shall be left around each plant as shown on the plans or as directed by the Construction Officer. On steep slopes the soil on the lower side of the plant shall be graded in such a manner that it will catch and hold water, as shown on the plans or as directed by the Construction Officer. The transplanted plants shall be watered with a minimum of twenty (20) gallons each, water the mycorrhizal powder added to

the water as per manufacturer's directions. Mycorrhizal powder may also be added to the backfill soil, as per manufacturer's directions.

After the shallow tree basins and plant saucers and shrub beds have been prepared, they shall be mulched, three to four inches (3-4") in depth, inside and along the outside edge of the basins/saucers. Mulch shall consist of shredded bark not exceeding three inches (3") in length and one inch (1") in width. Mulch contaminated with leaves, twigs, and/or debris shall not be acceptable. Only mulch derived from tree material, not from wood waste products like sawdust, shall be acceptable. Mulch for tree pits and shrub and/ or perennial beds shall be included in the bid price. After placing mulch on tree pits, the tree irrigation bags shall be installed and filled as per manufacturer's recommendations. Tree irrigation bags shall be included in the unit prices bid for the various Contract Items.

Pruning: Each plant shall be pruned to preserve its' natural character and in a manner appropriate to its' particular requirements. Dead, broken, or badly bruised crossing and rubbing branches shall be removed with a clean cut. In general, at least one-fourth (1/4) of the wood of deciduous plants shall be removed by thinning or shortening branches. Double leaders and multiple branched crotches shall be corrected.

No leaders shall be cut. All pruning shall be done with sharp tools in accordance with instructions of the Construction Officer. Evergreen plant material shall be pruned or sheared as directed by the Construction Officer.

Staking: All staking shall be done immediately after planting and all stakes and wire maintained. Plants shall stand plumb after staking. Stakes shall be of white cedar with bark attached. They may have a maximum allowable deflection of ten percent (10%).

Stakes shall be placed outside of the root ball and shall be driven thirty-six inches (36") into the ground for all trees under three and one-half inches (3-1/2") in caliper and shall be driven forty-eight inches (48") into the ground for all larger trees. Stakes shall be fastened to the tree with double #12 gauge, annealed, galvanized, steel wire run through a suitable length of new reinforced one-half inch (1/2") rubber hose. Stakes shall be set parallel to the contours, curbs, or walks unless otherwise directed by the Construction Officer. Trees shall be staked as follows:

Minor trees over three feet (3') high and less than ten feet (10') in height shall be supported by two (2) stakes five feet (5') long in accordance with the plans and specifications or as directed by the Construction Officer.

Major trees less than three and one-half inches (3 1/2") in caliper shall have two (2) stakes eight feet (8') long with a minimum stake diameter of three inches (3").

Major trees from three and one-half (3 1/2") to five inches (5") in caliper shall have three (3) stakes ten feet (10') long with a minimum stake diameter of three inches (3").

Major trees from five inches (5") and larger in caliper will have four (4) stakes with a minimum stake diameter of three (3") to three and one-half inches (3 1/2").

Stakes, wires, and hoses shall be removed at the end of the guarantee period unless otherwise directed by the Construction Officer.

**Spraying with Anti-Desiccant:** The Contractor shall spray all Plant Material with an anti-desiccant, using an approved power sprayer to apply an adequate film over trunks, branches, twigs, and/or foliage, as directed by the Construction Officer. The anti-desiccant shall be an emulsion which will provide a protective film over plant surfaces, permeable enough to permit transpiration. The anti-desiccant shall be Hydrotec-100, by Botanical Security Products Co., New York, NY; or Wilt Pruf, NCF, as manufactured by Nursery Specialties Products, Greenwich, CT; or approved equal. Anti-desiccants shall be delivered in containers of the manufacturer, shall be mixed according to directions, and applied to plant material within forty-eight (48) hours of each day's planting that is completed.

**Edging of Planting Areas:** The Contractor shall establish a neat edge where planting areas meet grass areas as shown on the plan or as directed by the Construction Officer. Edging shall be done by competent mechanics in a workmanlike manner with a spade or edging tool immediately after all planting is completed. Particular care shall be exercised in edging to establish good flowing curves as shown on the plans or as directed by the Construction Officer. Edging shall be maintained by the Contractor.

**Watering:** At the time of planting, the soil around each plant shall be thoroughly saturated with water and shall be thoroughly watered as seasonable conditions require throughout the entire maintenance period.

**Tree Irrigation Bags:** When planting trees, the Contractor shall provide irrigation bags and fill them so as to provide a minimum one inch (1") rainfall equivalent per week after the initial planting saturation. The irrigation bags shall be one hundred percent (100%) reinforced UV stable polyethylene, at least ten (10) mils. thick with a polyester scrim lining, such as TreeGator, as manufactured by Spectrum Products, Raleigh, NC, or approved equal. The irrigation bags shall have a minimum twenty gallon (20 gal.) capacity, and the Contractor shall fill the bags to capacity at least once per week during the contract period. The bags shall be installed with two (2) holes open to provide a drip time of six to ten hours (6-10 hrs).

### 3.8 LAWN MIX

**WORK:** Under this Item, the Contractor shall LAWN MIX areas with grass seed, ground limestone, fertilizer, compost, superphosphate, and topsoil and shall prepare, plant, and maintain lawn areas, in accordance with the plans, specifications, and directions of the Construction Officer.

#### MATERIALS:

**Grass Seed:** Grass seed shall be fresh, recleaned seed of the latest crop, mixed in the following proportions by weight and meeting the following

standards of pure live seed content (Purity & Germination) and maximum allowable weed seed content. All seed shall be free of noxious weeds and undesirable grasses.

#### GRASS SEED MIXTURE

PERCENT BY WEIGHT	GRASS SEED	PURITY SEED	MAXIMUM GERMINATION	WEED
60%	TALL FESCUE - One or more of the following varieties: Apache, Arid, Bonanza, Falcon, Jaguar, Mustang, Rebel II	98%	85%	.25%
20%	BLUEGRASS - One or more of the following varieties: Bensun(A-34), Bristol, Eclipse, P-105, Touchdown	98%	80%	.10%
20%	PERENNIAL RYEGRASS - one or more of the following varieties: All Star, Palmer, Pennant, Prelude, Premier, Yorktown II	98%	85%	.25%

All seed shall be certified under the auspices of a State Seed Improvement Cooperative and must bear their seals of certification on each fifty pound (50 lb.) bag. All Grass Seed shall be delivered in sealed standard size bags of the vendor, showing weight, analysis, and name of vendor. It shall be stored as directed by the Construction Officer, in such a manner than its' effectiveness will not be impaired.

The Construction Officer reserves the right to reject, on or after delivery, all material which does not, in their opinion, meet these specifications. The rate of seeding shall be ten pounds (10 lbs.) per one thousand (1,000) square feet.

Ground Limestone: Ground Limestone (Calcium Carbonate) shall have the following analysis: at least fifty percent (50%) shall pass a 200 mesh sieve, at least ninety percent (90%) shall pass a 100 mesh sieve, and one hundred percent (100%) shall pass a ten (10) mesh sieve.

Total carbonates shall not be less than eighty percent (80%) or 44.8% Calcium Oxide equivalent. For purposes of calculation, limestone may be substituted at the discretion of the Construction Officer, when wind conditions exceed five (5) miles per hour. The Contractor shall, at the direction and discretion of the Construction Officer, furnish a certified report of chemical analysis of representative samples of the limestone which he proposes to use. The contractor shall be responsible for inspection and laboratory charges. No limestone shall be delivered until the approval of samples by the Construction Officer, but such approval does not constitute final acceptance of the material. The Construction Officer



reserves the right to reject, on or after delivery, any material which does not, in their opinion, meet these specifications.

All limestone shall be delivered in standard size bags of the manufacturer showing weight, analysis, and name of the manufacturer. It shall be stored in such a manner that its effectiveness will not be impaired, as directed by the Construction Officer.

The rate of application of limestone per thousand (1,000) square feet shall be as follows, depending on the hydrogen ion concentration (pH) shown by a pH test (test to be provided by the Contractor at no additional cost to the Government):

pH	Rate/ Pounds
5.0-5.5	100
5.5-6.0	50
6.0-6.8	25
over 6.8	0

Commercial Fertilizer: Commercial fertilizer (10-6-4, 50% slow release) shall have the following composition by weight: Nitrogen ten percent (10%), Phosphoric Acid (P205) six percent (6%), and Potash four percent (4%). The guaranteed analysis shall have a minimum of fifty percent (50%) of the total nitrogen, derived from Ureaform, furnishing three and one-half percent (3.5%) minimum water insoluble Nitrogen. The balance of Nitrogen shall be present as Methylene Urea, soluble Urea Nitrate, and ammoniacal compounds.

The Contractor shall, at the direction and discretion of the Construction Officer, furnish a certified report of an approved analytical chemist, showing the analysis of representative samples of the commercial fertilizer (10-6-4, 50% slow release) they propose to use. All samples are to be taken by the Construction Officer, and delivered to the laboratory. The price bid shall include inspection and laboratory charges. No commercial fertilizer shall be delivered until approval of samples by the Construction Officer, but such approval does not constitute final acceptance. The Construction Officer reserves the right to reject, on or after delivery, any material which does not, in their opinion, meet these specifications.

All commercial fertilizer (10-6-4, 50% slow release) shall be delivered in standard size bags of the manufacturer, showing weight, analysis, and name of manufacturer. It shall be stored as directed by the Construction Officer, in such a manner that its' effectiveness will not be impaired.

Two (2) applications of acceptable commercial fertilizer shall be applied by machine, each application at the rate of twenty pounds (20 lbs.) per one thousand (1,000) square feet. The first application shall be made at the time of installation of seed as specified.

The second application shall be made approximately six (6) months after the first application. This treatment shall take place during the next appropriate fertilizing season, the following Spring or Fall, and shall be subject to the direction of the Construction Officer. The second

application shall be applied to the surface only. Incorporation shall be achieved by thoroughly watering the entire area after application. The Contractor shall provide all labor and materials, including water, if not available from local sources.

**Superphosphate:** Superphosphate shall contain twenty percent (20%) by weight of available phosphoric acid. Superphosphate shall be delivered in standard size bags of the manufacturer showing weight, analysis, and name of manufacturer. The Construction Officer reserves the right to make tests on the material at any time and acceptance or rejection shall be based upon results of these tests. The Construction Officer will designate where the superphosphate shall be stored on the job. Superphosphate shall be applied by machine at the rate of twenty pounds (20 lbs.) per one thousand (1000) square feet.

**Compost:** Compost shall be spread over all areas to be seeded at the rate of one cubic yard per one thousand (1,000) square feet. Compost shall contain organic matter or material of generally humus nature capable of sustaining the growth of vegetation, with no admixture of refuse or material toxic to plant growth. The Compost shall be free of pathogens and stones, roots, lumps, or similar objects larger than two inches (2") in greatest diameter, as well as roots, brush, and weeds.

Composts that have been derived from organic wastes such as food and agricultural residues, animal manures, and sewage sludge that meet the above requirements and are acceptable compost sources. Compost shall have an approximate N-P-K analysis of at least 1-1-0 as delivered, with a pH between 5.5 and 8.5 and a solids content of at least fifty percent (50%). Compost shall contain a minimum of fifty percent (50%) organic material.

Compost shall be "All-Gro Compost", as manufactured by All-Gro, Inc., Hampton, NH or "Nature's Choice Compost", as manufactured by Nature's Choice Corp., Union, NJ, or approved equal. Proposed substitutions must be submitted for review.

**TIME OF SEEDING:** Grass Seed shall be sown in the Fall during August and September, or in the Spring during March, April, and May, or at such other times as approved by the Construction Officer. All seeding is to be done in moderately dry to moist (not wet) soil and at times when the wind does not exceed a velocity of five (5) miles per hour.

**PREPARATION OF SEED BED:** Prior to seeding, all areas to receive seed shall be mown to a height of three-quarter inch (3/4") and raked clean. Existing topsoil shall remain and be supplemented as necessary to ensure the required six inch (6") depth. The subgrade shall be thoroughly loosened with a rototiller to a nine inch (9") depth prior to seeding and all sticks, stones, roots, vegetation, or other objectionable material which might interfere with the formation of a finely pulverized seed bed shall be removed from the soil. If additional topsoil is required to achieve a full six inch (6") depth, it shall be added prior to seeding and raked smooth. When added topsoil is four inches (4") or more in depth, it shall be compacted to the satisfaction of the Construction Officer.

**INSTALLATION:** Compost shall be thoroughly incorporated into the top five

inches (5") of topsoil. After the compost has been incorporated, limestone, fertilizer, and superphosphate shall be worked into the top three inches (3") of soil. The seed bed shall be graded to true lines, free from all unsightly variations, bumps, ridges, or depressions.

Grass seed shall be sown, covered to the proper depth, and firmed in such a manner that a uniform stand of grass will result. All areas to receive seed shall then be compacted, using a two hundred pound (200 lb.) roller.

**MAINTENANCE:** The Contractor shall maintain all seeded areas until final acceptance of the contract. The Contractor shall properly water as required to maintain a moist seed bed for optimum germination and as often as required to maintain optimum growing conditions for the new stand of grass until acceptance of the contract. If water is not available from local sources, the Contractor is responsible for supplying water from their own source.

The Contractor shall reseed any areas which fail to show a satisfactory stand of grass with the specified mixture of seed and fertilizer as many times as necessary, at no additional cost to the Government, until final acceptance of the Contract. The Contractor shall properly mow and otherwise maintain the grass at a maximum height of three inches (3"), or as directed by the Construction Officer, until final acceptance of the whole work under this contract.

### 3.9 NATIVE GRASS SEED MIXES #1, #2, #3, and #4 (NG- 1, NG-2, NG-3 & NG-4)

#### MATERIALS:

#### NG-1 Seed Mixture

<b>GRASSES</b>			
Scientific name	Common Name	Percentage of Mix by weight	Separate Seeding Rate
<i>Bouteloua curtipendula</i>	Side Oats Grama	10%	4 lbs./acre
<i>Bouteloua gracilis</i>	Blue Grama	5%	4 lbs./acre
<i>Festuca longifolia</i>	Hard Fescue	10%	0.25 lb./acre
<i>Festuca ovina</i>	Sheep's Fescue	7%	6 lbs./acre
<i>Festuca rubra</i> var. <i>commutata</i>	Chewings Fescue	5%	0.25 lb./acre
<i>Koeleria cristata</i> (pyramidata)	Prairie Junegrass	5%	1 lb./acre
<i>Panicum clandestinum</i>	Tioga Deertongue	7%	0.5 lb./acre
<i>Schizocharium scoparius</i>	Little Blue Stem	15%	6 lbs./acre
<b>PERENNIAL WILDFLOWERS</b>			
<i>Aquilegia canadensis</i>	Wild Columbine	1%	1 lb./acre
<i>Asclepias tuberosa</i>	Butterfly Weed	1%	1 lb./acre
<i>Aster ericoides</i>	Heath Aster	3%	1 lb./acre
<i>Aster laterifolius</i>	Calico Aster	1%	1 lb./acre
<i>Aster laevis</i>	Smooth Aster	1%	1 lb./acre
<i>Castilleja coccinea</i>	Indian Paintbrush	2%	1 lb./acre
<i>Chrysanthemum leucanth</i>	Oxeye Daisy	4%	1 lb./acre

Coreopsis lanceolata	Lance-Leaved Coreopsis	2%	1 lb./acre
Eupatorium coelestinum	Hardy Ageratum	1%	1 lb./acre
Gaillardia aristata	Blanket Flower	2%	1 lb./acre
Helianthus mollis	Downy Sunflower	2%	1 lb./acre
Lupinus perennis	Perennial Lupine	2%	1 lb./acre
Oenothera speciosa	Showy Evening Primrose	1%	1 lb./acre
Penstemon digitalis	Beardtongue	2%	1 lb./acre
Phlox paniculata	Summer Phlox	1%	1 lb./acre
Rudbeckia hirta	Black-eyed Susan	4%	1 lb./acre
Rudbeckia fulgida	Brilliant Coneflower	4%	1 lb./acre
Solidago speciosa	Showy Goldenrod	2%	1 lb./acre
Stokesia laevis	Stokes Aster	1%	1 lb./acre

NG1 SEEDING RATE: The Contractor shall seed the prepared NG-1 Seed Mixture at 15 bulk pounds/per acre or seed each identified grass and perennial wildflower individually with the separate seeding rate listed above in the table.

#### NG-2 Seed Mixture

GRASSES			
Scientific name	Common Name	Percentage of Mix by weight	Separate Seeding Rate
Andropogon gerardii	Big Bluestem	10%	4 lbs./acre
Bouteloua curtipendula	Side Oats Grama	5%	4 lbs./acre
Bouteloua gracilis	Blue Grama	5%	4 lbs./acre
Panicum virgatum	Switchgrass	7%	4 lbs./acre
Sorghastrum nutans	Indiangrass	35%	4 lbs./acre

PERENNIAL WILDFLOWERS			
Asclepias tuberosa	Butterfly Weed	1%	1 lb./acre
Aster prenanthoides	Zig Zag Aster	2%	1 lb./acre
Aster novae-angliae	New England Aster	3%	1 lb./acre
Aster novi-belgii	New York Aster	3%	1 lb./acre
Castilleja coccinea	Indian Paintbrush	2%	1 lb./acre
Chrysanthemum leucanth	Oxeye Daisy	4%	1 lb./acre
Coreopsis lanceolata	Lance-Leaved Coreopsis	2%	1 lb./acre
Eupatorium coelestinum	Hardy Ageratum	1%	1 lb./acre
Gaillardia aristata	Blanket Flower	3%	1 lb./acre
Heliopsis helianthoides	Ox-Eyed Sunflower	2%	1 lb./acre
Lupinus perennis	Perennial Lupine	3%	1 lb./acre
Oenothera speciosa	Showy Evening Primrose	1%	1 lb./acre
Penstemon digitalis	Beardtongue	2%	1 lb./acre
Phlox paniculata	Summer Phlox	1%	1 lb./acre
Rudbeckia hirta	Black-eyed Susan	4%	1 lb./acre
Rudbeckia triloba	Brown-eyed Susan	4%	1 lb./acre
Solidago juncea	Early Goldenrod	2%	1 lb./acre

NG2 SEEDING RATE: The Contractor shall seed the prepared NG-2 Seed Mixture at 15 bulk pounds/per acre or seed each identified grass and perennial wildflower individually with the separate seeding rate listed above in the table.

## NG-3 Seed Mixture

GRASSES			
Scientific name	Common Name	Percentage of Mix by weight	Separate Seeding Rate
<i>Agrostis stolonifera</i>	Creeping Bentgrass	25%	4 lbs./acre
<i>Alopecurus pratensis</i>	Meadow Foxtail	25%	4 lbs./acre
<i>Elymus virginicus</i>	Virginia Wild Rye	25%	4 lbs./acre
<i>Leersia oryzoides</i>	Rice Cutgrass	4%	4 lbs./acre
<i>Sparganium curycarpum</i>	Giant Bur-Reed	4%	4 lbs./acre
<i>Scirpus atrovirens</i>	Green Bulrush	4%	1 lb./acre
<i>Scirpus polyphyllus</i>	Many-leaved Bulrush	3%	1 lb./acre
<i>Scirpus cyperinus</i>	Woolgrass	1%	1 lb./acre
<i>Scirpus expansus</i>	Wood Bulrush	1%	1 lb./acre
PERENNIAL WILDFLOWERS			
<i>Bidens aristosa</i>	Showy Tickseed Sunflower	3%	1 lb./acre
<i>Aster puniceus</i>	Purple Stemmed Aster	2%	1 lb./acre
<i>Verbena hastata</i>	Blue Vervain	1%	1 lb./acre
<i>Mimulus ringens</i>	Monkey Flower	1%	1 lb./acre
<i>Solidago patula</i>	Rough-leaf Goldenrod	1%	1 lb./acre

NG3 SEEDING RATE: The Contractor shall seed the prepared NG-3 Seed Mixture at 20 bulk pounds/per acre or seed each identified grass and perennial wildflower individually with the separate seeding rate listed above in the table. The above seed mix is available as a ready made seed mix from Ernst Conservation Seeds, Meadville, PA (Retention Basin Floor Seeding for Wildlife and Plant Diversity Mix - ERNMX-127).

## NG-4 Seed Mixture

GRASSES			
Scientific name	Common Name	Percentage of Mix by weight	Separate Seeding Rate
<i>Andropogon gerardii</i>	Big Bluestem	15%	4 lbs./acre
<i>Andropogon scoparius</i>	Little Bluestem	15%	4 lbs./acre
<i>Elymus riparius</i>	Riverbank Wild Rye	10%	4 lbs./acre
<i>Asclepias incarnata</i>	Swamp Milkweed	9%	4 lbs./acre
<i>Verbesina alternifolia</i>	Wingstem	6%	4 lbs./acre
<i>Aster laevis</i>	Silky Smooth Aster	5%	1 lb./acre
<i>Aster umbellatus</i>	Flat-Top Aster	5%	1 lb./acre
<i>Eupatorium fistulosum</i>	Joe Pye Weed	5%	1 lb./acre
PERENNIAL WILDFLOWERS			
<i>Heliopsis helianthoides</i>	Ox-Eye Sunflower	5%	1 lb./acre
<i>Penstemon digitalis</i>	Beard Tongue	5%	1 lb./acre
<i>Eupatorium perfoliatum</i>	Boneset	4%	1 lb./acre
<i>Helianthus giganteus</i>	Giant Sunflower	4%	1 lb./acre
<i>Solidago rugosa</i>	Wrinkle-leaf Goldenrod	4%	1 lb./acre
<i>Vernonia noveboracensis</i>	New York Ironweed	3%	1 lb./acre
<i>Coreopsis tripteris</i>	Tall Tickseed	2%	1 lb./acre
<i>Liatris spicata</i>	Spiked Gayfeather	2%	1 lb./acre

Verbena hastata	Blue Vervain	1%	1 lb./acre
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NG-4 SEEDING RATE: The Contractor shall seed the prepared NG-4 Seed Mixture at 15 bulk pounds/per acre or seed each identified grass and perennial wildflower individually with the separate seeding rate listed above in the table. The above seed mix is available as a ready made seed mix from Ernst Conservation Seeds, Meadville, PA (Tall-Showy Mix - ERNMX - 136).

TIME OF SEEDING: Grass Seed shall be sown in the Fall during August and September, or in the Spring during March, April, and May, or at such other times as approved by the Construction Officer. All seeding is to be done in moderately dry to moist (not wet) soil and at times when the wind does not exceed a velocity of five (5) miles per hour.

SOIL PREPARATION: The Contractor shall take soil tests in each of the seed mix areas to be analyzed at the Rutgers Cooperative Extension. If the pH is below 5.0, apply lime to adjust the pH to 5.0-6.0. The soil test should also be used to determine need and level of fertilization suitable for the site. Apply only Phosphorous and Potassium fertilizers if the soil test indicates these constituents to be low. Do not apply nitrogen.

SITE PREPARATION: Removing and controlling existing weedy growth is the first step in creating a natural habitat. Regardless of the planting method to be used, it is essential to control weeds prior to seeding native warm season grasses. An herbicide application is preferred to tillage immediately prior to planting. If tillage is used for weed control, the area should be reworked at least two weeks prior to planting to prepare a firm seedbed. Herbicide carryover can pose a threat to new plantings. Herbicides such as Basagran, Blazer, Classic, Poast, Plateau, and Roundup have low persistence and generally do not pose a risk for carryover. The Contractor shall use any of the herbicides listed above if herbicides are required for weed control. The cover crop of oats should minimize weed growth on site. It will be necessary to mow the cover crop prior to seeding with the native grass mixes.

SEEDING METHODS: The following methods may be utilized for seeding:  
Broadcast Seeding: Broadcast by hand or knapsack seeder using the proper seeding rate, carefully proportioning seed for the entire area. Sand or sawdust can be added to help proportion the seed. Follow by rolling or tracking the seed into the top ¼ inch of the soil to achieve good seed to soil contact. Cover with a light layer of straw mulch or erosion control blankets.

Hydroseeding: Hydroseeding is typically used on steep slopes and roadside cuts. Apply seed and a small amount of hydromulch for good seed placement. Follow up with erosion control blankets, straw mulch, or hydromulch to cover seed.

Drill Seeding: Native grasses and wildflowers require a drill with a seed box developed for light, fluffy seed. These drills are generally practical for large areas without steep slopes for operation. The use of a drill can promote good seed to soil contact and minimize use of mulch.

FIRST YEAR MAINTENANCE: When vegetation reaches 12 to 18 inches tall, mow to no less than six inches by rotary mowing or weed eater to prevent the weeds from going to seed. Most native plants will grow deeper root systems in the first year than tops, and mowing to six or eight inches will not hurt them. This allows sunlight to reach desired species. Do not mow with standard lawn mower. Mowing too low promotes weed growth.

The Contractor shall maintain all seeded areas until final acceptance of the contract. The Contractor shall properly water as required to maintain a moist seed bed for optimum germination and as often as required to maintain optimum growing conditions for the new stand of grass until acceptance of the contract. If water is not available from local sources, the Contractor is responsible for supplying water from their own source.

The Contractor shall reseed any areas which fail to show a satisfactory stand of grass with the specified mixture of seed and fertilizer as many times as necessary, at no additional cost to the Government, until final acceptance of the Contract. The Contractor shall properly mow and otherwise maintain the grass at a maximum height of three inches (3"), or as directed by the Construction Officer, until final acceptance of the whole work under this contract.

SEED QUALITY: All named cultivars or selected varieties shall be certified seed. Unless authorized by the Construction Officer, the seed shall be from crops that are two (2) years old or less. These seeds shall be supplied as single species, partial seed mixes, or full seed mixes in separate bags as indicated on the plans. Seeds shall be fresh, free of deleterious material and disease, and delivered to the site in the original, unopened bags showing certification guarantee of analysis including the composition, purity, and germination percentages, and percent weed seed. At the time of delivery, the germination test shall be less than nine (9) months old. Unless specified otherwise, seed shall not contain in excess one percent (2%) of weed seed as defined in applicable State law and regulation; zero percent (0%) is desirable. The Construction Officer reserves the right to conduct germination tests for each bag. It is the sole responsibility of the Contractor to provide Pure Live Seed.

-- End of Section --

## SECTION 02630

## STORM-DRAINAGE SYSTEM

09/98

Item No. 26a - Aluminum Hatch Frame and Cover 30"x36"  
Item No. 26b - Aluminum Hatch Frame and Cover 30"x42"  
Item No. 26c - Aluminum Hatch Frame and Cover 30"x60"  
Item No. 26d - Aluminum Hatch Frame and Cover 30"x84"  
Item No. 28a - Manhole Frame and Cover or Grates - Standard  
Item No. 29 - Manhole Steps  
Item No. 30 - Handholds  
Item No. 31 - Fixed Ladder  
Item No. 32 - Retractable Safety Post  
Item No. 37c - 18" Diameter Pipe  
Item No. 37d - 24" Diameter Pipe  
Item No. 37g - 60" Diameter Pipe  
Item No. 57 - Manhole, 48" Inside Diameter

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M 190	(1988) Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M 198	(1994) Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets
AASHTO M 243	(1994) Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches
AASHTO M 294	(1994) Corrugated Polyethylene Pipe, 305- to 915- mm (12-to 36 in.) Diameter
AASHTO MP6	(1995) Corrugated Polyethylene Pipe 1050 and 1200 mm Diameter



## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123	(1997a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 760	(1997) Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
ASTM A 849	(1996) Post Applied Coatings, Pavings and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM B 209	(1996) Aluminum Aluminum-Alloy Sheet & Plate Castings
ASTM B 308	(1996) Aluminum-Alloy 6061-T6 Standard Structural Profiles
ASTM C 76	(1997) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C 139	(1997) Concrete Masonry Units for Construction of Catch Basins and Manholes
ASTM C 270	(1997a) Mortar for Unit Masonry
ASTM C 443	(1994) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C 478	(1997) Precast Reinforced Concrete Manhole Sections
ASTM C 789	(1995a) Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers
ASTM C 924	(1989; R 1997) Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
ASTM C 1103	(1994) Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM D 1784	(1997) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 3034	(1994) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3212	(1996a) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

ASTM D 3350	1996) Polyethylene Plastics Pipe and Fittings Materials
ASTM F 477	(1995) Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 679	(1995) Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
ASTM F 794	(1995a) Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
ASTM F 894	(1995) Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F 1417	(1992) Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI AH.3	Ladders, Fixed, Safety Requirements
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES

SD-01 DATA

Pipes; G

Manholes and Inlets; G

Frames and Covers or Grates; G

Manufactured Safety Post Extensions; G

Aluminum Hatch Frames and Covers; G

Submit data indicating the products to be used.

SD-6 Instructions

Placing Pipe

Printed copies of the manufacturer's recommendations for installation procedures of the material being placed, prior to installation.

#### SD-13 Certificates

Resin Certification

Pipeline Testing; G

Hydrostatic Test on Watertight Joints; G

Determination of Density; G

Frame and Cover or Gratings; G

Certified copies of test reports demonstrating conformance to applicable pipe specifications, before pipe is installed. Certification on the ability of frame and cover or gratings to carry the imposed live load.

### 1.3 DELIVERY, STORAGE, AND HANDLING

#### 1.3.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times and shall follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install plastic pipe shall be stored in accordance with the manufacturer's recommendations and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

#### 1.3.2 HandlingSub Title

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

## PART 2 PRODUCTS

### 2.1 PIPE FOR CULVERTS AND STORM DRAINS

Pipe for culverts and storm drains shall be of the sizes indicated and shall conform to the requirements specified. Pipe which falls under the footprint of the levee or flood wall or pass through such structure shall be reinforced concrete pipe as specified. Pipe outside the footprint of the levee and flood wall may be chosen from the materials listed below.

#### 2.1.1 Concrete Pipe

ASTM C 76 Class III, IV.

##### 2.1.1.1 Nonreinforced Concrete Pipe

ASTM C 14 Class II, III

#### 2.1.2 Corrugated Steel Pipe

##### 2.1.2.1 Fully Bituminous Coated, Fully Paved

AASHTO M 190 Type D and ASTM A 760/A 760M aluminum-zinc alloy coated Type I corrugated steel pipe with helical corrugations and annular reformed ends. Pipe shall be 16 gauge with 1/2 inch x 2 2/3 inches corrugations.

##### 2.1.2.2 Bituminous Coated Concrete-Lined

ASTM A 760/A 760M zinc coated Type I corrugated steel pipe with helical corrugations and annular reformed ends and a concrete lining in accordance with ASTM A 849. The concrete lining shall be not less than 3/8 inch over the inside crest of the corrugation. Pipe shall be 16 gauge with 1/2 inch x 2 2/3 inches corrugation.

#### 2.1.3 PVC Pipe

The pipe manufacturer's resin certification, indicating the cell classification of PVC used to manufacture the pipe, shall be submitted prior to installation of the pipe.

##### 2.1.3.1 Type PSM PVC Pipe

ASTM D 3034, Type PSM, maximum SDR 35, produced from PVC certified by the compounder as meeting the requirements of ASTM D 1784, minimum cell class 12454-B.

#### 2.1.3.2 Profile PVC Pipe

ASTM F 794, Series 46, produced from PVC certified by the compounder as meeting the requirements of ASTM D 1784, minimum cell class 12454-B.

#### 2.1.3.3 Smooth Wall PVC Pipe

ASTM F 679 produced from PVC certified by the compounder as meeting the requirements of ASTM D 1784, minimum cell class 12454-B.

#### 2.1.3.4 Corrugated PVC Pipe

ASTM F 949 produced from PVC certified by the compounder as meeting the requirements of ASTM D 1784, minimum cell class 12454-B.

#### 2.1.4 Precast Reinforced Concrete Box Culvert

For highway loadings with 2 feet of cover or more or subjected to dead load only, ASTM C 789; for less than 2 feet of cover subjected to highway loading, ASTM C 850.

### 2.2 MISCELLANEOUS MATERIALS

#### 2.2.1 Concrete

Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements for 3000 psi concrete under Section 03301 CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS. The concrete mixture shall have air content by volume of concrete, based on measurements made immediately after discharge from the mixer, of 5 to 7 percent when maximum size of coarse aggregate exceeds 1-1/2 inches. Air content shall be determined in accordance with ASTM C 231. The concrete covering over steel reinforcing shall be as shown on the drawings but not be less than 1 inch thick for covers and not less than 1-1/2 inches thick for walls and flooring. Concrete covering deposited directly against the ground shall have a

thickness of at least 3 inches between steel and ground. Expansion-joint filler material shall conform to ASTM D 1751, or ASTM D 1752, or shall be resin-impregnated fiberboard conforming to the physical requirements of ASTM D 1752.

#### 2.2.2 Mortar

Mortar for pipe joints, connections to other drainage structures, and brick or block construction shall conform to ASTM C 270, Type M, except that the maximum placement time shall be 1 hour. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar but in no case shall exceed 5 gallons of water per sack of cement. Water shall be clean and free of harmful acids, alkalies, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. The mortar head on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

#### 2.2.3 Precast Concrete Segmental Blocks

Precast concrete segmental block shall conform to ASTM C 139, not more than 8 inches thick, not less than 8 inches long, and of such shape that joints can be sealed effectively and bonded with cement mortar.

#### 2.2.4 Precast Reinforced Concrete Manholes and Inlets

Precast reinforced concrete manholes shall conform to ASTM C 478. Joints between precast concrete risers and tops shall be made with flexible watertight, rubber-type gaskets meeting the requirements of paragraph JOINTS.

#### 2.2.5 Frame and Cover or Gratings

Frame and cover or gratings shall be cast gray iron, ASTM A 48, Class 35B; cast ductile iron, ASTM A 536, Grade 65-45-12. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans.

#### 2.2.6 Aluminum Hatch Frame and Cover

Aluminum frames and covers shall be fabricated from 6061-T6 aluminum (ASTM B 308), for bars angles and extrusions, and 1/4 inches diamond plate 5086 aluminum (ASTM B 209). Size, shapes, and details shall be as shown on the contract drawings.

## 2.2.7 Joints

### 2.2.7.1 Flexible Watertight Joints for Concrete Pipe

a. Materials: Flexible watertight joints shall be made with plastic or rubber-type gaskets for concrete pipe. The design of joints and the physical requirements for plastic gaskets shall conform to AASHTO M 198, and rubber-type gaskets shall conform to ASTM C 443. Gaskets shall have not more than one factory-fabricated splice, except that two factory-fabricated splices of the rubber-type gasket are permitted if the nominal diameter of the pipe being gasketed exceeds 54 inches.

b. Test Requirements: Watertight joints shall be tested and shall meet test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS. Rubber gaskets shall comply with the oil resistant gasket requirements of ASTM C 443. Certified copies of test results shall be delivered to the Contracting Officer before gaskets or jointing materials are installed. Alternate types of watertight joint may be furnished, if specifically approved.

### 2.2.7.2 External Sealing Bands for Noncircular Concrete Culverts

External sealing bands shall conform to (ASTM C 877)

### 2.2.7.3 Flexible Watertight, Gasketed Joints

a. Gaskets: Rubber O-ring gaskets shall be 13/16 inch in diameter for pipe diameters of 36 inches or smaller and 7/8 inch in diameter for larger pipe having 1/2 inch deep end corrugation. O-rings shall meet the requirements of AASHTO M 198 or ASTM C 443. Flexible plastic gaskets shall conform to requirements of AASHTO M 198, Type B.

b. Connecting Bands: Connecting bands shall be of the type, size and sheet thickness of band, and the size of angles, bolts, rods and lugs as indicated or where not indicated as specified in the applicable standards or specifications for the pipe. Exterior rivet heads in the longitudinal seam under the connecting band shall be countersunk or the rivets shall be omitted and the seam welded. Watertight joints shall be tested and shall meet the test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS.

### 2.2.7.4 PVC Plastic Pipes

Joints shall be elastomeric gasket type in accordance with the specification for the pipe and as recommended by the pipe manufacturer.

## 2.3 STEEL LADDER

Steel ladder shall be provided where the depth of the manhole exceeds 12 feet. These ladders shall be not less than 16 inches in width, with 3/4 inch diameter rungs spaced 12 inches apart. The two stringers shall be a minimum 3/8 inch thick and 2-1/2 inches wide. Ladders and inserts shall be galvanized after fabrication in conformance with ASTM A 123/A 123M.

### 2.3.1 Extension Posts

All ladders shall be equipped with the manufacturer's extension posts which meet ANSI A14.3

#### 2.3.1.1 Safety Post Extension

Safety post extension: Post extension for fixed ladders constructed of tubular aluminum sections with adjustable mounting brackets for attachment on top of ladder.

- a. Operation: Upward and downward movement controlled by spring balancing mechanism activated by release rod. Automatically locks when fully extended.
- b. Permanently mount operating instructions on safety post to be plainly visible to ladder users.

## 2.4 MANHOLE STEPS AND HANDHOLDS

Manholes and handholes shall be of the type and size indicated on the drawings. Steps and handholds shall be installed where indicated on the drawings.

## 2.5 HYDROSTATIC TEST ON WATERTIGHT JOINTS

### 2.5.1 Concrete and PVC Pipe



A hydrostatic test shall be made on the watertight joint types as proposed.

Only one sample joint of each type needs testing; however, if the sample joint fails because of faulty design or workmanship, an additional sample joint may be tested. During the test period, gaskets or other jointing material shall be protected from extreme temperatures which might adversely affect the performance of such materials. Performance requirements for joints in reinforced and nonreinforced concrete pipe shall conform to AASHTO M 198 or ASTM C 443. Test requirements for joints in PVC plastic pipe shall conform to ASTM D 3212.

#### 2.5.2 Corrugated Steel Pipe

A hydrostatic test shall be made on the watertight joint system proposed. The moment strength required of the joint is expressed as 15 percent of the calculated moment capacity of the pipe on a transverse section remote from the joint by the AASHTO HB-16 (Division II, Section 26). The pipe shall be supported for the hydrostatic test with the joint located at the point which develops 15 percent of the moment capacity of the pipe based on the allowable span in feet for the pipe flowing full or 40,000 foot-pounds, whichever is less. Performance requirements shall be met at an internal hydrostatic pressure of 10 psi for a 10 minute period for both annular corrugated metal pipe and helical corrugated metal pipe with factory reformed ends.

### PART 3 EXECUTION

#### 3.1 EXCAVATION FOR PIPE CULVERTS, STORM DRAINS, AND DRAINAGE STRUCTURES

Excavation of trenches, and for appurtenances and backfilling for culverts and storm drains, shall be in accordance with the applicable portions of Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS and Section 02311 LEVEE CONSTRUCTION.

#### 3.2 PLACING PIPE Sub Title

Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Plastic pipe shall be protected from exposure to direct sunlight prior to laying, if necessary to maintain

adequate pipe stiffness and meet installation deflection requirements. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Pipe shall not be laid in water, and pipe shall not be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. Deflection of installed flexible pipe shall not exceed the following limits:

TYPE OF PIPE	MAXIMUM ALLOWABLE DEFLECTION (%)
Corrugated Steel	5
Concrete-Lined Corrugated Steel	3
Plastic	7.5

Not less than 30 days after the completion of backfilling, the Government may perform a deflection test on the entire length of installed flexible pipe using a mandrel or other suitable device. Installed flexible pipe showing deflections greater than those indicated above shall be retested by a run from the opposite direction. If the retest also fails, the suspect pipe shall be replaced at no cost to the Government.

### 3.2.1 Concrete, PVC, and Ribbed PVC and Ductile Iron Pipe

Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.

### 3.2.2 Corrugated Metal Pipe and Pipe Arch

Laying shall be with the separate sections joined firmly together, with the outside laps of circumferential joints pointing upstream, and with longitudinal laps on the sides. Fully paved steel pipe or pipe arch shall have a painted or otherwise applied label inside the pipe indicating sheet thickness of pipe. Any unprotected metal in the joints shall be coated with bituminous material as specified in AASHTO M 190 or AASHTO M 243. Interior coating shall be protected against damage from insertion or removal of struts or tie wires. Lifting lugs shall be used to facilitate moving pipe without damage to exterior or interior coatings. During installation, pipe or pipe arch shall be handled with care to preclude damage to the bituminous coating or paving. Prior to placing backfill, damaged areas of coupling bands and pipe shall be given a coating of bituminous material, as specified in AASHTO M 190 or AASHTO M 243. Pipe on which bituminous coating has been damaged to such an extent that satisfactory field repairs cannot be made shall be removed and replaced at no additional cost to the Government.

### 3.3 JOINTING

#### 3.3.1 Concrete

##### 3.3.1.1 Flexible Watertight Joints

Gaskets and jointing materials shall be as recommended by the particular manufacturer in regard to use of lubricants, cements, adhesives, and other special installation requirements. Surfaces to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installing the pipe; any loose or improperly affixed gaskets and jointing materials shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pushed home. If, while the joint is being made the gasket becomes visibly dislocated the pipe shall be removed and the joint remade.

##### 3.3.1.2 External Sealing Band Joint for Noncircular Pipe

Surfaces to receive sealing bands shall be dry and clean. Bands shall be installed in accordance with manufacturer's recommendations.

#### 3.3.2 Corrugated Metal Pipe

##### 3.3.2.1 Flexible Watertight, Gasketed Joints

Installation shall be as recommended by the gasket manufacturer for use of lubricants and cements and other special installation requirements. The gasket shall be placed over one end of a section of pipe for half the width of the gasket. The other half shall be doubled over the end of the same pipe. When the adjoining section of pipe is in place, the doubled-over half of the gasket shall then be rolled over the adjoining section. Any unevenness in overlap shall be corrected so that the gasket covers the end of pipe sections equally. Connecting bands shall be centered over adjoining sections of pipe, and rods or bolts placed in position and nuts tightened. Band Tightening: The band shall be tightened evenly, even tension being kept on the rods or bolts, and the gasket; the gasket shall seat properly in the corrugations. Watertight joints shall remain uncovered for a period of time designated, and before being covered, tightness of the nuts shall be measured with a torque wrench. If the nut has tended to loosen its grip on the bolts or rods, the nut shall be retightened with a torque wrench and remain uncovered until a tight, permanent joint is assured.

### 3.4 DRAINAGE STRUCTURES

#### 3.4.1 Manholes and Inlets

Construction shall be of reinforced concrete, precast reinforced concrete, precast concrete segmental blocks, complete with frames and covers or gratings; and with fixed galvanized steel ladders where required.

#### 3.4.2 Walls, Headwalls, Junction Chambers, Control Manholes, and Outlet/Inlet Structures

Construction shall be cast in place.

### 3.5 STEEL LADDER INSTALLATION

Ladder shall be adequately anchored to the wall by means of steel inserts spaced not more than 6 feet vertically, and shall be installed to provide at least 6 inches of space between the wall and the rungs. The wall along the line of the ladder shall be vertical for its entire length.

#### 3.5.1 Ladder Safety

- a. Safety post extension: Attach to top 2 rungs of ladder and center between the rails. Adjust post to extend 42 inches above top rung when roof hatch is open and post is fully extended.
- b. After installation inspect ladder to verify proper, secure, and safe installation.
- c. Clean ladder using clean water and mild detergent. Do not use abrasive agent, steel wool, or harsh chemicals. Rinse with clean water.

### 3.6 MANHOLE STEPS AND HANDHOLES

Manhole steps and handles shall be installed as indicated on the drawings.

### 3.7 PIPELINE TESTING Sub Title

Lines shall be tested for leakage by low pressure air or water testing or exfiltration tests, as appropriate. Low pressure air testing for concrete

pipes shall conform to ASTM C 924. Low pressure air testing for plastic pipe shall conform to ASTM F 1417. Low pressure air testing procedures for other pipe materials shall use the pressures and testing times prescribed in ASTM C 828 or ASTM C 924, after consultation with the pipe manufacturer.

Testing of individual joints for leakage by low pressure air or water shall conform to ASTM C 1103. Prior to exfiltration tests, the trench shall be backfilled up to at least the lower half of the pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection.

Visible leaks encountered shall be corrected regardless of leakage test results. When the water table is 2 feet or more above the top of the pipe at the upper end of the pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Contracting Officer. An exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both the water table and the top of the pipe at the upper end of the pipeline to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be reestablished. The amount of water required to maintain this water level during a 2-hour test period shall be measured.

Leakage as measured by the exfiltration test shall not exceed 250 gallons per inch in diameter per mile or 0.2 gallons per inch in diameter per 100 feet of pipeline per hour. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished. Testing, correcting, and retesting shall be made at no additional cost to the Government.

-- End of Section --

## SECTION 02713

BITUMINOUS BASE COURSE  
08/97

## Item No. 40 - Bituminous Stabilized Base Course

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO T 102 (1983) Spot Test of Asphaltic Materials

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 29/C 29M (1991a) Unit Weight and Voids in Aggregate

ASTM C 88 (1990) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

ASTM C 127 (1988; R 1993) Specific Gravity and Absorption of Coarse Aggregate

ASTM C 128 (1993) Specific Gravity and Absorption of Fine Aggregate

ASTM C 131 (1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM C 136 (1996a) Sieve Analysis of Fine and Coarse Aggregates

ASTM C 183 (1995a) Sampling and the Amount of Testing of Hydraulic Cement

ASTM D 5 (1995) Penetration of Bituminous Materials

ASTM D 75 (1987; R 1992) Sampling Aggregates

ASTM D 140 (1993) Sampling Bituminous Materials

ASTM D 242 (1995) Mineral Filler for Bituminous Paving Mixtures

ASTM D 946	(1982; R 1993) Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D 1250	(1980; R 1990) Petroleum Measurement Tables
ASTM D 1856	(1995a) Recovery of Asphalt From Solution by Abson Method
ASTM D 2172	(1995) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil and Rock
ASTM D 3381	(1992) Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D 3515	(1996) Hot-Mixed, Hot-Laid Bituminous Paving Mixtures
ASTM D 4318	(1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

NEW JERSEY DEPARTMENT OF TRANSPORTATION(NJDOT)

Standard Specification for Road and Bridge Construction

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Job-Mix Formula (JMF).

Mix design at least 30 days before it is to be used.

SD-09 Reports

Sources of Aggregates. Bituminous Materials. Sampling and testing.

Copies of field tests results within 24 hours after the tests are performed. Certified copies of tests results for approval not less than 30 days before material is required for the work.

SD-14 Samples

Sources of Aggregates.

Samples of a new source of aggregates for approval.

## SD-18 Records

Waybills and delivery tickets. Sources of Aggregates.

Copies of waybills and delivery tickets during the progress of the work. Certified waybills and delivery tickets for all materials actually used. Plan for operation of a new source of aggregates well in advance of starting production.

## 1.3 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory or by facilities furnished by the Contractor. No work requiring testing shall be permitted until the facilities have been inspected and approved. The first inspection shall be at the expense of the Government. Cost incurred for any subsequent inspection required because of failure of the facilities to pass the first inspection will be charged to the Contractor. Tests shall be performed in sufficient numbers and at the locations and times directed to ensure that materials, mixtures and compaction meet specified requirements. Samples of finished pavement, including samples that span the longitudinal joint, shall be obtained by the Contractor. Sizes of samples shall be suitable to determine conformance to density, thickness, and other specified requirements. Samples shall be taken at start of paving operations and at intervals throughout paving operations as directed. Samples of plant mixtures will be taken and tested by the Contractor to determine conformance to specified requirements. Certified copies of the test results shall be furnished to the Contracting Officer.

## 1.3.1 Aggregates

Sampling shall be in accordance with ASTM D 75. Samples of aggregates shall be tested at the start of production and at intervals during production of the bituminous base course. Intervals and points of sampling will be as approved. Test results on these samples will be the basis for approval of specific lots of aggregates.

## 1.3.2 Mineral Filler

Sampling of mineral filler shall conform to NJDOT.

## 1.3.3 Bituminous Materials

Sampling of bituminous materials shall conform to NJDOT.

## 1.3.4 Field Sampling of Pavements and Mixtures

The type, size, and locations of samples will be approved. The Contractor shall furnish all tools, labor, and materials for cutting samples and will be responsible for replacing pavement to meet specified requirements. Samples of finished pavement shall be cut at the rate of one sample per 1000 square yards of finished pavement.



#### 1.4 PLANT, EQUIPMENT, MACHINES, TOOLS, AND PERSONNEL

##### 1.4.1 Bituminous Plant

The bituminous plant shall be of such capacity, as specified herein, to produce the quantities of bituminous mixtures required for the project within the completion time of the contract. Hauling equipment, paving machines, rollers, miscellaneous equipment, and tools shall be provided in sufficient numbers and capacity and in proper working condition to place the bituminous paving mixtures at a rate equal to the plant output. A sufficient number of adequately trained personnel shall be available during paving operations to produce a pavement meeting the requirements in this specification.

##### 1.4.2 Mixing Plants

Mixing plants shall be an automatic or semiautomatic controlled, commercially manufactured unit designed, coordinated, and operated to consistently produce a mixture within the job-mix formula (JMF). The plant shall have a minimum capacity of 100 tons per hour. Drum mixers will be prequalified at the production rate to be used during actual mix production. The prequalification tests will include extraction in accordance with ASTM D 2172 and recovery of the asphalt cement in accordance with ASTM D 1856. The penetration of the recovered asphalt binder shall not be less than 60 percent of the original penetration in accordance with ASTM D 5.

#### 1.5 WEATHER LIMITATIONS

Bituminous courses shall not be constructed when the underlying course contains free surface water. Unless otherwise directed, asphalt courses shall not be constructed when temperature of the surface of the underlying course is below 40 degrees F.

#### 1.6 Waybills and Delivery Tickets

Copies of waybills and delivery tickets shall be submitted during progress of work. Before the final statement is allowed, the Contractor shall submit certified waybills and certified delivery tickets for all aggregates and bituminous materials actually used in construction covered by the contract. The Contractor shall not remove bituminous material from the tank cars or storage tanks until the initial outage and temperature measurements have been taken, nor shall the car or tank be released until the final outage has been taken by the Contracting Officer.

### PART 2 PRODUCTS

#### 2.1 AGGREGATES

Aggregates shall consist of the materials specified in NJDOT Standard Specification, Sections 304 and 903.

##### 2.1.1 Mineral Filler

Mineral filler shall conform to ASTM D 242.

#### 2.1.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be measured in accordance with ASTM D 4318. Requirements stated herein shall apply to any aggregate component that is blended to meet the required gradation and also to the aggregate in the completed base course. The portion of the aggregate passing the No. 40 sieve shall be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

#### 2.1.3 Sources of Aggregates

Sources of aggregates shall be selected well in advance of the time the material will be required in the work. If a previously developed source is selected, test results shall be submitted with evidence that central plant hot-mix bituminous pavements constructed with the aggregates have had a satisfactory service record of at least 5 years under similar climatic conditions. An inspection of the producer's operation may be made. When new sources are developed, the Contractor shall indicate the sources and submit samples for approval and a plan for operation well in advance of starting production. Proposed sources may be inspected. The Contractor shall make such tests and other investigations as necessary to determine whether or not aggregates meeting the requirements specified can be produced from the proposed sources. Inspection of the source of aggregate does not relieve the Contractor of the responsibility for delivery at the jobsite of aggregates that meet requirements specified herein.

### 2.2 BITUMINOUS MATERIALS

Sources where bituminous materials are obtained shall be selected in advance of time when materials will be required in the work, and test results shall be submitted for approval not less than 30 days before such material is required for use in the work.

#### 2.2.1 Asphalt Cement

Asphalt cement to be mixed with mineral aggregates shall conform to NJDOT Standard Specification - Section 904.

#### 2.2.2 Quality Control

In addition to initial qualification testing of bituminous materials, samples shall be taken before and during construction when shipments of bituminous materials are received or when necessary to assure that some condition of handling or storage has not been detrimental to the bituminous material.

### 2.3 AGGREGATE GRADATION

Mineral aggregate shall be of such size that percentage composition by NJDOT Standard Specification - Table 903-1, Designation I-2.

### 2.4 COMPOSITION OF MIXTURE

#### 2.4.1 Job-Mix Formula (JMF)

No bituminous mixture shall be produced until a JMF has been approved by the Contracting Officer. The formula will conform to NJDOT Standard Specification, Section 903.02

#### 2.4.2 Test Properties of Bituminous Mixtures

The finished mixture shall meet requirements when tested in accordance with NJDOT Standard Specification, Section 903.03.

### PART 3 EXECUTION

#### 3.1 CONDITIONING OF UNDERLYING COURSE

Prior to placing the bituminous base course, the underlying surface shall be cleaned of foreign or objectionable matter. The condition of the underlying course will be inspected and approved. Text

##### 3.1.1 Execution of the Base

Execution of the base course shall conform to the requirements in NJDOT Standard Specification, Section 304.

#### 3.2 MIXING

##### 3.2.1 Mixing of the Base Course

Mixing of the bituminous base course shall conform to the requirements of the NJDOT Standard Specification, Sections 304 and 404.

##### 3.2.2 Preparation of Mineral Aggregates

Each aggregate stockpile shall be placed and maintained in such a manner to prevent segregation. Rates of feed of aggregates shall be regulated so that the moisture content and temperature of aggregates will be within tolerances specified within NJDOT Standard Specification. Dry storage shall be provided for mineral filler.

#### 3.3 TRANSPORTATION OF BITUMINOUS MIXTURE

Transportation of bituminous mixture from the paving plant to the site shall be in trucks having tight, clean, smooth beds lightly coated with an approved releasing agent to prevent adhesion of mixture to truck bodies. Excessive releasing agent will be drained prior to loading. Each load shall be covered with canvas or other approved material of ample size to protect mixture from weather and prevent loss of heat. Loads that have crusts of cold, unworkable material or have become wet by rain will be rejected. Hauling over freshly placed material will not be permitted. Transportation of the bituminous mixtures shall conform to the requirements in NJDOT Standard Specification, Sections 302 and 404.

#### 3.4 PLACING

Bituminous mixtures shall not be placed without ample time to complete spreading and rolling during daylight hours, unless satisfactory artificial lighting is provided. Placing shall conform to the requirements in NJDOT Standard Specification, Sections 303 and 404.

### 3.5 GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS

Finished surfaces of bituminous base courses, when tested as specified below, shall conform to the gradeline and elevations shown and to surface-smoothness requirements specified. The finished surfaces and tolerances shall meet the requirements of NJDOT Standard Specification, Sections 303 and 304.

#### 3.5.1 Equipment

The Contractor shall furnish and maintain at the site, in good condition, one straightedge for each bituminous paver for use in testing the finished surface. Straightedges shall be aluminum and have blades of box or box-girder cross section with flat bottom reinforced to insure rigidity and accuracy. Straightedges shall have handles to facilitate movement on pavement.

### 3.6 COMPACTION OF MIXTURE

Rolling shall begin as soon after placing as the mixture will bear roller without undue displacement. Delays in rolling freshly spread mixture will not be permitted. After the initial rolling, preliminary tests of the crown, grade, and smoothness shall be made by the Contractor. Deficiencies shall be corrected so that the finished course will conform to requirements for the grade and smoothness specified herein. After the Contractor assures himself of meeting crown, grade, and smoothness requirements, rolling shall be continued until a density of at least 96 percent of laboratory compacted specimens of the same mixture is obtained. Places inaccessible to rollers shall be thoroughly compacted with hot hand tampers. Compaction shall meet the requirements in NJDOT Standard Specifications, Sections 303 and 304.

#### 3.6.1 Correcting Deficient Areas

Mixtures that become contaminated or are defective shall be removed. Skin patching of an area that has been rolled will not be permitted. Holes shall be cut the full thickness of the base course so that the sides are perpendicular and parallel to the direction of traffic and the edges are vertical. Bulges shall be sprayed with bituminous materials conforming to requirements of Section 02748 BITUMINOUS TACK AND PRIME COATS. Fresh paving mixture shall be placed in holes in sufficient quantity so that the finished surface will conform to grade, smoothness, and density requirements.

### 3.7 JOINTS

#### 3.7.1 General

Joints between old and new pavements or between successive day's work, or joints that have become cold because of delay, shall be made carefully to insure continuous bond between old and new sections of course. All joints shall have the same texture, density, and smoothness as other sections of the course. Contact surfaces of previously constructed pavements that have become coated with dust, sand, or other objectionable material shall be cleaned by brushing or cut back with approved power saw, as directed. The surface against which new material is placed shall be sprayed with a thin, uniform coat of bituminous material conforming to requirements of Section 02748 BITUMINOUS TACK AND PRIME COATS. The material shall be applied far enough in advance of placement of the fresh mixture to insure adequate curing. Care shall be taken to prevent damage or contamination of sprayed surface.

#### 3.7.2 Transverse Joints

The roller shall pass over the unprotected end of freshly placed mixture only when placing of the course is discontinued or when delivery of the mixture is interrupted to the extent that the unrolled material may become cold. In all cases, the edge of the previously placed course shall be cut back to expose an even, vertical surface for the full thickness of the course. In continuing placement of the strip, the mechanical spreader shall be positioned on the transverse joint so that sufficient hot mixture will be spread to obtain a joint after rolling that conforms to the required density and smoothness specified herein.

#### 3.7.3 Longitudinal Joints

Edges of a previously placed strip that have cooled or are irregular, honeycombed, poorly compacted, damaged, or otherwise defective, and unsatisfactory sections of the joint shall be cut back to expose a clean, sound surface for the full thickness of the course as directed.

#### 3.8 EDGES OF PAVEMENT

Bulges adjacent to shoulders shall be trimmed neatly to the line.

#### 3.9 PROTECTION OF PAVEMENT

After final rolling of the pavement, no vehicular traffic of any kind shall be permitted until the pavement has cooled to ambient temperature.

-- End of Section --

## SECTION 02721

DENSE GRADED AGGREGATE COURSES  
03/97

Item No. 39b - Dense Graded Aggregate Base Course 12" Thick

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO T 180	(1993) Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and an 457-mm (18-in) Drop
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## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 29	(1991a) Unit Weight and Voids in Aggregate
ASTM C 117	(1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1995a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1992) Sampling Aggregates
ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in

	Place by the Rubber Balloon Method
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1993) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes

#### NEW JERSEY DEPARTMENT OF TRANSPORTATION

#### NJDOT Standard Specifications for Road and Bridge Construction

### 1.2 DEGREE OF COMPACTION

Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 or ASHTO T 180, Method D. In this specification, degree of compaction shall be a percentage of laboratory maximum density.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-01 Data

Equipment; G.

List of proposed equipment to be used in performance of construction work, including descriptive data.

#### SD-09 Reports

Sampling and Testing; G.

Copies of initial and in-place test results.

#### SD-18 Records

Waybills and Delivery Tickets; G.

Copies of waybills and delivery tickets during the progress of the work.

Certified waybills and delivery tickets for all aggregates actually used.

#### 1.4 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved testing laboratory in accordance with Section 01451 CONTRACTOR QUALITY CONTROL. Tests shall be performed at the specified frequency. No work requiring testing will be permitted until the testing laboratory has been inspected and approved. The materials shall be tested to establish compliance with the specified requirements.

##### 1.4.1 Sampling

Samples for laboratory testing shall be taken in conformance with ASTM D 75. When deemed necessary, the sampling will be observed by the Contracting Officer.

##### 1.4.2 Tests

###### 1.4.2.1 Sieve Analysis

Sieve analysis shall be made in conformance with ASTM C 117 and ASTM C 136 and ASTM D 422. Sieves shall conform to ASTM E 11.

###### 1.4.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

###### 1.4.2.3 Moisture-Density Determinations

The maximum density and optimum moisture shall be determined in accordance with ASTM D 1557 or AASHTO T 180, Method D.

###### 1.4.2.4 Density Tests

Density shall be field measured in accordance with ASTM D 1556. The base plate, as shown in the drawing shall be used. For density test, ASTM D 2167, the calibration curves shall be checked and adjusted, if necessary, using only the sand cone method as described in paragraph Calibration, of the ASTM publication. Tests performed in accordance with ASTM D 2922 result in a wet unit weight of soil and, when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in paragraph Calibration, in ASTM D 2922, on each different type of material to be tested at the beginning of a job and at intervals as directed.

###### 1.4.2.5 Wear Test

Wear tests shall be made on density graded aggregate base course material



in conformance with ASTM C 131.

#### 1.4.2.6 Weight of Slag

Weight per cubic foot of slag shall be determined in accordance with ASTM C 29 on the subbase course material.

#### 1.4.3 Testing Frequency

##### 1.4.3.1 Initial Tests

One of each of the following tests shall be performed on the proposed material prior to commencing construction to demonstrate that the proposed material meets all specified requirements prior to installation.

- a. Sieve Analysis including 0.02 mm size material
- b. Liquid limit and plasticity index moisture-density relationship
- c. Wear
- d. Weight per cubic foot of Slag
- .

##### 1.4.3.2 In-Place Tests

One of each of the following tests shall be performed on samples taken from the placed and compacted course. Samples shall be taken for each 1,000 square yards of each layer of material placed in each area.

- a. Sieve Analysis including 0.02 mm size material
- b. Field Density
- c. Moisture liquid limit and plasticity index

#### 1.4.4 Approval of Material

The source of the material shall be selected 30 days prior to the time the material will be required in the work. Approval of the materials will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and compacted subbase course.

#### 1.5 WEATHER LIMITATIONS

Construction shall be done when the atmospheric temperature is above 35 degrees F. When the temperature falls below 35 degrees F, the Contractor shall protect all completed areas by approved methods against detrimental effects of freezing. Completed areas damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements.

#### 1.6 EQUIPMENT

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Course

Aggregates shall consist of crushed stone or slag, gravel, sand, or other sound, durable, approved materials processed and blended or naturally combined. Aggregates shall be durable and sound, free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material. Material retained on the No. 4 sieve shall have a percentage of wear not to exceed 50 percent after 500 revolutions when tested as specified in ASTM C 131. Aggregate shall be reasonably uniform in density and quality. Slag shall be an air-cooled, blast-furnace product having a dry weight of not less than 65 pcf. Aggregates shall have a maximum size of 1 inch and shall be within the limits specified.

Particles having diameters less than 0.0008 inches shall not be in excess of 3 percent by weight of the total sample tested as determined in accordance with ASTM D 422. The portion of any blended component and of the completed course passing the No. 40 sieve shall be either nonplastic or shall have a liquid limit not greater than 25 and a plasticity index not greater than 5.

## PART 3 EXECUTION

### 3.1 OPERATION OF AGGREGATE SOURCES

All clearing, stripping and excavating work involved in the opening or operation of aggregate sources shall be performed by the Contractor. Aggregate sources shall be opened to working depth in a manner that produces excavation faces that are as nearly vertical as practicable for the materials being excavated. Materials excavated from aggregate sources shall be obtained in successive cuts extending through all exposed strata. All pockets or strata of unsuitable materials overlying or occurring in the deposit shall be wasted as directed. The methods of operating aggregate sources and the processing and blending of the material may be changed or modified by the Contracting Officer, when necessary, in order to obtain material conforming to specified requirements. Upon completion of work, aggregate sources on Government reservations shall be conditioned to drain readily, and shall be left in a satisfactory condition. Aggregate sources on private lands shall be conditioned in agreement with local laws and authorities.

### 3.2 STOCKPILING MATERIAL

Prior to stockpiling of material, storage sites shall be cleared and leveled by the Contractor. All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall be stockpiled on the cleared and leveled areas designated by the Contracting Officer so as to prevent segregation. Materials obtained from different sources shall be stockpiled separately.

### 3.3 PREPARATION OF UNDERLYING MATERIAL

Prior to constructing the dense graded aggregate base course, the underlying course or subgrade shall be cleaned of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. Ruts, or soft yielding spots, in the underlying courses, subgrade areas having inadequate compaction, and deviations of the surface from the specified requirements, shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in ASTM D 2487, the surface shall be stabilized prior to placement of the subbase course. Stabilization shall be accomplished by mixing subbase-course material into the underlying course, and compacting by approved methods. The stabilized material shall be considered as part of the underlying course and shall meet all requirements for the underlying course. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the subbase course is placed.

### 3.4 GRADE CONTROL

The finished and completed subbase course shall conform to the lines, grades, and cross sections shown. The lines, grades, and cross sections shown shall be maintained by means of line and grade stakes placed by the Contractor at the work site.

### 3.5 MIXING AND PLACING MATERIALS

The materials shall be mixed and placed to obtain uniformity of the dense graded aggregate base course material at the water content specified. The Contractor shall make such adjustments in mixing or placing procedures or in equipment as may be directed to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to insure a satisfactory subbase course.

### 3.6 LAYER THICKNESS

The compacted thickness of the completed course shall be as indicated. When a compacted layer of 6 inches is specified, the material may be placed in a single layer; when a compacted thickness of more than 6 inches is required, no layer shall exceed 6 inches nor be less than 3 inches when compacted.

### 3.7 COMPACTION

Each layer of the dense graded aggregate base course shall be compacted as specified with approved compaction equipment. Water content shall be maintained during the compaction procedure to within plus or minus 3 percent of optimum water content, as determined from laboratory tests, as specified in paragraph SAMPLING AND TESTING. In all places not accessible to the rollers, the mixture shall be compacted with hand-operated power

tampers. Compaction shall continue until each layer is compacted through the full depth to at least 3 percent of laboratory maximum density. The Contractor shall make such adjustments in compacting or finishing procedures as may be directed to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory subbase course. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked, as directed, to meet the requirements of this specification.

### 3.8 EDGES

Approved material shall be placed along the edges of the dense graded aggregate base course in such quantity as will compact to the thickness of the course being constructed. When the course is being constructed in two or more layers, at least a 1 foot width of the shoulder shall be rolled and compacted simultaneously with the rolling and compacting of each layer of the subbase course, as directed.

### 3.9 SMOOTHNESS TEST

The surface of each layer shall not show deviations in excess of 3/8 inch when tested with a 12 foot straightedge applied parallel with and at right angles to the centerline of the area to be paved. Deviations exceeding this amount shall be corrected by removing material, replacing with new material, or reworking existing material and compacting, as directed.

### 3.10 THICKNESS CONTROL

The completed thickness of the dense graded aggregate base course shall be in accordance with the thickness and grade indicated on the drawings. The thickness of each course shall be measured at intervals providing at least one measurement for each 500 square yards or part thereof of subbase course. The thickness measurement shall be made by test holes, at least 3 inches in diameter through the course. The completed subbase course shall not be more than 1/2 inch deficient in thickness nor more than 1/2 inch above or below the established grade. Where any of these tolerances are exceeded, the Contractor shall correct such areas by scarifying, adding new material of proper gradation or removing material, and compacting, as directed. Where the measured thickness is 1/2 inch or more thicker than shown, the course will be considered as conforming with the specified thickness requirements plus 1/2 inch. The average job thickness shall be the average of the job measurements as specified above but within 1/4 inch of the thickness shown.

### 3.11 MAINTENANCE

The dense graded aggregate base course shall be maintained in a satisfactory condition until accepted.

-- End of Section --

## SECTION 02721A

## SUBBASE COURSES

03/97

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO T 180 (1997) Moisture-Density Relations of Soils  
Using a 4.54-kg (10-lb) Rammer and an  
457-mm (18-in) Drop

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 29/C 29M (1997) Bulk Density ("Unit Weight") and  
Voids in Aggregates

ASTM C 117 (1995) Materials Finer Than 75 micrometer  
(No. 200) Sieve in Mineral Aggregates by  
Washing

ASTM C 131 (1996) Resistance to Degradation of  
Small-Size Coarse Aggregate by Abrasion  
and Impact in the Los Angeles Machine

ASTM C 136 (1996) Sieve Analysis of Fine and Coarse  
Aggregates

ASTM D 75 (1987; R 1997) Sampling Aggregates

ASTM D 422 (1963; R 1998) Particle-Size Analysis of  
Soils

ASTM D 1556 (1990; R 1996el) Density and Unit Weight  
of Soil in Place by the Sand-Cone Method

ASTM D 1557 (1998) Laboratory Compaction  
Characteristics of Soil Using Modified  
Effort (56,000 ft-lbf/cu. ft. (2,700  
kN-m/cu.m.))

ASTM D 2167 (1994) Density and Unit Weight of Soil in  
Place by the Rubber Balloon Method

ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-03 Product Data

#### Equipment

List of proposed equipment to be used in performance of construction work, including descriptive data.

#### Waybills and Delivery Tickets

Copies of waybills and delivery tickets during the progress of the work. Certified waybills and delivery tickets for all aggregates actually used.

### SD-06 Test Reports

#### Sampling and Testing; G RE

Copies of initial and in-place test results.

## 1.3 DEGREE OF COMPACTION

Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 and/or in AASHTO T 180, Method D. In this specification, degree of compaction shall be a percentage of laboratory maximum density.

## 1.4 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved testing laboratory in accordance with Section 01451 CONTRACTOR QUALITY CONTROL. Tests shall be performed at the specified frequency. No work requiring testing will be permitted until the testing laboratory has been inspected and approved. The materials shall be tested to establish compliance with the specified requirements.

#### 1.4.1 Sampling

Samples for laboratory testing shall be taken in conformance with ASTM D 75.

When deemed necessary, the sampling will be observed by the Contracting Officer.

#### 1.4.2 Tests

##### 1.4.2.1 Sieve Analysis

Sieve analysis shall be made in conformance with ASTM C 117 and ASTM C 136, and/or ASTM D 422. Sieves shall conform to ASTM E 11.

##### 1.4.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

##### 1.4.2.3 Moisture-Density Determinations

The maximum density and optimum moisture shall be determined in accordance with ASTM D 1557 and/or AASHTO T 180 Method D, .

##### 1.4.2.4 Density Tests

Density shall be field measured in accordance with ASTM D 1556. The base plate, as shown in the drawing shall be used. ASTM D 2167. ASTM D 2922. The calibration curves shall be checked and adjusted, if necessary, using only the sand cone method as described in paragraph Calibration, of the ASTM publication. Tests performed in accordance with ASTM D 2922 result in a wet unit weight of soil and, when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in paragraph Calibration, in ASTM D 2922, on each different type of material to be tested at the beginning of a job and at intervals as directed.

##### 1.4.2.5 Wear Test

Wear tests shall be made on subbase course material in conformance with ASTM C 131.

#### 1.4.3 Testing Frequency

#### 1.4.3.1 Initial Tests

One of each of the following tests shall be performed on the proposed material prior to commencing construction to demonstrate that the proposed material meets all specified requirements prior to installation.

- a. Sieve Analysis including 0.02 mm size material
- b. Liquid limit and plasticity index moisture-density relationship

#### 1.4.3.2 In-Place Tests

One of each of the following tests shall be performed on samples taken from the placed and compacted subbase course. Samples shall be taken for each 200 square yards of each layer of material placed in each area.

- a. Sieve Analysis including 0.02 mm size material
- b. Field Density
- c. Moisture liquid limit and plasticity index

#### 1.4.4 Approval of Material

The source of the material shall be selected 30 days prior to the time the material will be required in the work. Approval of the materials will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and compacted subbase course.

#### 1.5 WEATHER LIMITATIONS

Construction shall be done when the atmospheric temperature is above 35 degrees F. When the temperature falls below 35 degrees F, the Contractor shall protect all completed areas by approved methods against detrimental effects of freezing. Completed areas damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements.

#### 1.6 EQUIPMENT

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

##### 2.1.1 Subbase Course

Aggregates shall consist of crushed stone or slag, gravel, shell, sand, or other sound, durable, approved materials processed and blended or naturally combined. Aggregates shall be durable and sound, free from lumps and balls



of clay, organic matter, objectionable coatings, and other foreign material. Material retained on the No. 4 sieve shall have a percentage of wear not to exceed 50 percent after 500 revolutions when tested as specified in ASTM C 131. Aggregate shall be reasonably uniform in density and quality. Slag shall be an air-cooled, blast-furnace product having a dry weight of not less than 65 pcf. Aggregates shall have a maximum size of 1 inch and shall be within the limits specified as follows:

Maximum Allowable Percentage by Weight  
Passing Square-Mesh Sieve

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Sieve Designation

No.2

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No. 10

80

No. 200

15

Particles having diameters less than 0.0008 inches shall not be in excess of 3 percent by weight of the total sample tested as determined in accordance with ASTM D 422. The portion of any blended component and of the completed course passing the No. 40 sieve shall be either nonplastic or shall have a liquid limit not greater than 25 and a plasticity index not greater than 5.

### PART 3 EXECUTION

#### 3.1 OPERATION OF AGGREGATE SOURCES

All clearing, stripping and excavating work involved in the opening or operation of aggregate sources shall be performed by the Contractor. Aggregate sources shall be opened to working depth in a manner that produces excavation faces that are as nearly vertical as practicable for the materials being excavated. Materials excavated from aggregate sources shall be obtained in successive cuts extending through all exposed strata. All pockets or strata of unsuitable materials overlying or occurring in the deposit shall be wasted as directed. The methods of operating aggregate sources and the processing and blending of the material may be changed or modified by the Contracting Officer, when necessary, in order to obtain material conforming to specified requirements. Upon completion of work, aggregate sources on Government reservations shall be conditioned to drain readily, and shall be left in a satisfactory condition. Aggregate sources on private lands shall be conditioned in agreement with local laws and authorities.

#### 3.2 STOCKPILING MATERIAL

Prior to stockpiling of material, storage sites shall be cleared and leveled by the Contractor. All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall be stockpiled on the

cleared and leveled areas designated by the Contracting Officer so as to prevent segregation. Materials obtained from different sources shall be stockpiled separately.

### 3.3 PREPARATION OF UNDERLYING MATERIAL

Prior to constructing the subbase course, the underlying course or subgrade shall be cleaned of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. Ruts, or soft yielding spots, in the underlying courses, subgrade areas having inadequate compaction, and deviations of the surface from the specified requirements, shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the subbase course is placed.

### 3.4 GRADE CONTROL

The finished and completed subbase course shall conform to the lines, grades, and cross sections shown. The lines, grades, and cross sections shown shall be maintained by means of line and grade stakes placed by the Contractor at the work site.

### 3.5 MIXING AND PLACING MATERIALS

The materials shall be mixed and placed to obtain uniformity of the subbase material at the water content specified. The Contractor shall make such adjustments in mixing or placing procedures or in equipment as may be directed to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to insure a satisfactory subbase course.

### 3.6 LAYER THICKNESS

The compacted thickness of the completed course shall be as indicated. When a compacted layer of 6 inches is specified, the material may be placed in a single layer; when a compacted thickness of more than 6 inches is required, no layer shall exceed 6 inches nor be less than 3 inches when compacted.

### 3.7 COMPACTION

Each layer of the subbase course shall be compacted as specified with approved compaction equipment. Water content shall be maintained during the compaction procedure to within plus or minus 3 percent of optimum water content, as determined from laboratory tests, as specified in paragraph SAMPLING AND TESTING. In all places not accessible to the rollers, the mixture shall be compacted with hand-operated power tampers. Compaction shall continue until each layer is compacted through the full depth to at least 95 percent of laboratory maximum density. The Contractor shall make such adjustments in compacting or finishing procedures as may be directed to obtain true grades, to minimize segregation and degradation, to reduce

or increase water content, and to ensure a satisfactory subbase course. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked, as directed, to meet the requirements of this specification.

### 3.8 EDGES

Approved material shall be placed along the edges of the subbase course in such quantity as will compact to the thickness of the course being constructed. When the course is being constructed in two or more layers, at least a 1 foot width of the shoulder shall be rolled and compacted simultaneously with the rolling and compacting of each layer of the subbase course, as directed.

### 3.9 SMOOTHNESS TEST

The surface of each layer shall not show deviations in excess of 3/8 inch when tested with a 12 foot straightedge applied parallel with and at right angles to the centerline of the area to be paved. Deviations exceeding this amount shall be corrected by removing material, replacing with new material, or reworking existing material and compacting, as directed.

### 3.10 THICKNESS CONTROL

The completed thickness of the subbase course shall be in accordance with the thickness and grade indicated on the drawings. The thickness of each course shall be measured at intervals providing at least one measurement for each 500 square yards or part thereof of subbase course. The thickness measurement shall be made by test holes, at least 3 inches in diameter through the course. The completed subbase course shall not be more than 1/2 inch deficient in thickness nor more than 1/2 inch above or below the established grade. Where any of these tolerances are exceeded, the Contractor shall correct such areas by scarifying, adding new material of proper gradation or removing material, and compacting, as directed. Where the measured thickness is 1/2 inch or more thicker than shown, the course will be considered as conforming with the specified thickness requirements plus 1/2 inch. The average job thickness shall be the average of the job measurements as specified above but within 1/4 inch of the thickness shown.

### 3.11 MAINTENANCE

The subbase course shall be maintained in a satisfactory condition until accepted.

-- End of Section --

## SECTION 02741

HOT-MIX ASPHALT (HMA) FOR ROADS  
09/99

Item No. 41a - Bituminous Concrete Surface Course, Mix I-5  
Item No. 41b - Bituminous Concrete Binder Course, Mix I-3

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO MP1	(1997) Performance Graded Asphalt Binder
AASHTO MP2	(1997) Superpave Volumetric Mix Design
AASHTO TP53	(1995) Determining Asphalt Content of Hot Mix Asphalt by the Ignition Method

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 29/C 29M	(1997) Bulk Density (Unit Weight) and Voids in Aggregates
ASTM C 88	(1998) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	(1995) Materials Finer than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 566	(1997) Total Evaporable Moisture Content of Aggregate by Drying

ASTM C 1252	(1993) Uncompacted Void Content of Fine Aggregate (as Influenced by Particle Shape, Surface Texture, and Grading)
ASTM D 140	(1998) Sampling Bituminous Materials
ASTM D 242	(1995) Mineral Filler for Bituminous Paving Mixtures
ASTM D 946	(1982; R 1993) Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D 995	(1995b) Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures
ASTM D 1461	(1985; R 1994) Moisture or Volatile Distillates in Bituminous Paving Mixtures
ASTM D 1559	(1989) Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
ASTM D 2041	(1995) Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D 2172	(1995) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D 2419	(1995) Sand Equivalent Value of Soils and Fine Aggregate
ASTM D 2489	(1984; R 1994) Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D 2726	(1996a) Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixture
ASTM D 2950	(1997) Density of Bituminous Concrete in Place by Nuclear Method
ASTM D 3381	(1992) Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D 3665	(1994) Random Sampling of Construction Materials
ASTM D 3666	(1996a) Minimum Requirements for Agencies Testing and Inspecting Bituminous Paving Materials
ASTM D 4125	(1994) Asphalt Content of Bituminous Mixtures by the Nuclear Method

ASTM D 4791	(1995) Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D 4867/D 4867M	(1996) Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D 5444	(1994) Mechanical Size Analysis of Extracted Aggregate
ASTM D 6307	(1998) Asphalt Content of Hot Mix Asphalt by Ignition Method

ASPHALT INSTITUTE (AI)

AI MS-2	(1994) Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types
AI MS-20	(1991) Asphalt Hot-Mix Recycling

CORPS OF ENGINEERS (COE)

COE CRD-C 171	(1995) Test Method for Determining Percentage of Crushed Particles in Aggregate
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NEW JERSEY DEPARTMENT OF TRANSPORTATION

Standard Specification for Road and Bridge Construction (NJDOTSS)

1.2 DESCRIPTION OF WORK

The work shall consist of pavement courses composed of mineral aggregate and asphalt material heated and mixed in a central mixing plant and placed on a prepared course. HMA designed and constructed in accordance with this section shall conform to the lines, grades, thicknesses, and typical cross sections shown on the drawings. Each course shall be constructed to the depth, section, or elevation required by the drawings and shall be rolled, finished, and approved before the placement of the next course.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-09 Reports

Aggregates; G. QC Monitoring.

Aggregate and QC test results.

## SD-13 Certificates

Asphalt Cement Binder; G.

Copies of certified test data.

Testing Laboratory.

Certification of compliance.

Plant Scale Calibration Certification

## SD-14 Samples

Asphalt Cement Binder; G.

(5 gallon) sample for mix design verification.

Aggregates; G.

Sufficient materials to produce 200 lb of blended mixture for mix design verification.

## SD-18 Records

Mix Design; G.

Proposed JMF.

Contractor Quality Control; G.

Quality control plan.

Material Acceptance and Percent Payment;G

Acceptance test results and pay calculations

## 1.4 ASPHALT MIXING PLANT

Plants used for the preparation of hot-mix asphalt shall conform to the requirements of NJDOT Standard Specification for Road and Bridge Construction Section 404.

## 1.5 HAULING EQUIPMENT

Trucks used for hauling hot-mix asphalt shall have tight, clean, and smooth metal beds. To prevent the mixture from adhering to them, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other approved material. Petroleum based products shall not be used as a release agent. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers (tarps) shall be securely fastened. Trucks shall conform to the requirements of NJDOT

## Standard Specification for Road and Bridge Construction Section 404.

## 1.6 ASPHALT PAVERS

Asphalt pavers shall be self-propelled, with an activated screed, heated as necessary, and shall be capable of spreading and finishing courses of hot-mix asphalt which will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface. The pavers shall conform to the NJDOT Standard Specification for Road and Bridge Construction Section 404.

## 1.6.1 Receiving Hopper

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed without segregation. The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. The hoppers shall conform to the NJDOT Standard Specification for Road and Bridge Construction Section 404.

## 1.6.2 Automatic Grade Controls

Automatic grade control device shall conform to the NJDOT Standard Specification for Road and Bridge Construction Section 404.

## 1.7 ROLLERS

Rollers shall be in good condition and shall be operated at slow speeds to avoid displacement of the asphalt mixture. The number, type, and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Equipment which causes excessive crushing of the aggregate shall not be used. Rollers shall conform to the NJDOT Standard Specification for Road and Bridge Construction Section 404.

## 1.8 WEATHER LIMITATIONS

The hot-mix asphalt shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 1. The temperature requirements may be waived by the Contracting Officer, if requested; however, all other requirements, including compaction, shall be met.

Table 1. Surface Temperature Limitations of Underlying Course

Mat Thickness, inches	Degrees F
3 or greater	40
Less than 3	45

## PART 2 PRODUCTS



## 2.1 AGGREGATES

Aggregates shall consist of crushed stone, crushed gravel, crushed slag, screenings, natural sand and mineral filler, as required. The portion of material retained on the No. 4 sieve is coarse aggregate. The portion of material passing the No. 4 sieve and retained on the No. 200 sieve is fine aggregate. The portion passing the No. 200 sieve is defined as mineral filler. All aggregate test results and samples shall be submitted to the Contracting Officer at least 14 days prior to start of construction.

### 2.1.1 Coarse Aggregate

Coarse aggregate shall consist of sound, tough, durable particles, free from films of material that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other deleterious substances. All individual coarse aggregate sources shall meet the requirements of the NJDOT Standard Specification for Road and Bridge Construction Section 903.

### 2.1.2 Fine Aggregate

Fine aggregate shall consist of clean, sound, tough, durable particles. The aggregate particles shall be free from coatings of clay, silt, or any objectionable material and shall contain no clay balls. All individual fine aggregate sources shall have a sand equivalent value greater not less than 45 when tested in accordance with ASTM D 2419.

The fine aggregate portion of the blended aggregate shall have an uncompacted void content not less than 43.0 percent when tested in accordance with ASTM C 1252 Method A. Fine aggregate shall conform to the NJDOT Standard Specification for Road and Bridge Construction Section 901.

### 2.1.3 Mineral Filler

Mineral filler shall be nonplastic material meeting the requirements of the NJDOT Standard Specification for Road and Bridge Construction Section 901.

### 2.1.4 Aggregate Gradation

The combined aggregate gradation shall conform to gradations specified in Table 2, when tested in accordance with ASTM C 136 and ASTM C 117, and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa, but grade uniformly from coarse to fine.

Table 2. Aggregate Gradations

<u>NJDOTSS</u>	<u>WEARING</u>	<u>BINDER</u>
Table 901-2	I-5	I-3

## 2.2 ASPHALT CEMENT BINDER

Asphalt cement binder shall conform to NJDOTSS Section 904.

## 2.3 MIX DESIGN

The Contractor shall develop the mix design. The asphalt mix shall be composed of a mixture of well-graded aggregate, mineral filler if required, and asphalt material. The aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF). No hot-mix asphalt for payment shall be produced until a JMF has been approved. The hot-mix asphalt shall be designed using procedures contained in NJDOTSS Sections 404 and 903.

At the option of the contractor a currently used DOT superpave hot mix may be used in lieu of developing a new hot mix design study as described herein. The superpave volumetric mix shall be designed in accordance with AASHTO MP2.

### 2.3.1 JMF Requirements

The job mix formula shall be submitted in writing by the Contractor for approval at least 14 days prior to the start of the test section and shall include as a minimum shown in the NJDOTSS Subsection 903.02.

### 2.3.2 Adjustments to Field JMF

The Laboratory JMF for each mixture shall be in effect until a new formula is approved in writing by the Contracting Officer. Should a change in sources of any materials be made, a new laboratory jmf design shall be performed and a new JMF approved before the new material is used. The Contractor will be allowed to adjust the Laboratory JMF within the limits specified in the NJDOTSS Section 903 to optimize mix volumetric properties with the approval of the Contracting Officer. Adjustments to the Laboratory JMF shall be applied to the field (plant) established JMF and limited to those values as shown.

If adjustments are needed that exceed these limits, a new mix design shall be developed. Tolerances given above may permit the aggregate grading to be outside the limits shown in the NJDOTSS; while not desirable, this is acceptable.

## PART 3 EXECUTION

### 3.1 PREPARATION OF ASPHALT BINDER MATERIAL

The asphalt cement material shall be heated avoiding local overheating and providing a continuous supply of the asphalt material to the mixer at a uniform temperature. The temperature of unmodified asphalts shall be no more than 325 degrees F when added to the aggregates. Modified asphalts shall be no more than 350 degrees F when added to the aggregates.

### 3.2 PREPARATION OF MINERAL AGGREGATE

The aggregate for the mixture shall be heated and dried prior to mixing. No damage shall occur to the aggregates due to the maximum temperature and

rate of heating used. The temperature of the aggregate and mineral filler shall not exceed 350 degrees F when the asphalt cement is added. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

### 3.3 PREPARATION OF HOT-MIX ASPHALT MIXTURE

The aggregates and the asphalt cement shall be weighed or metered and introduced into the mixer in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but no less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D 2489, for each individual plant and for each type of aggregate used.

The wet mixing time will be set to at least achieve 95 percent of coated particles. The moisture content of all hot-mix asphalt upon discharge from the plant shall not exceed 0.5 percent by total weight of mixture as measured by ASTM D 1461.

### 3.4 PREPARATION OF THE UNDERLYING SURFACE

Immediately before placing the hot mix asphalt, the underlying course shall be cleaned of dust and debris. A prime coat and/or tack coat shall be applied in accordance with the contract specifications.

### 3.5 TEST SECTION

The Contracting Officer may require the Contractor to place a test section in conformance with the NJDOTSS Section 404.

#### 3.5.1 Additional Test Sections

If the initial test section should prove to be unacceptable, the necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made. A second test section shall then be placed. Additional test sections, as required, shall be constructed and evaluated for conformance to the specifications. Full production shall not begin until an acceptable section has been constructed and accepted.

### 3.6 TESTING LABORATORY

The laboratory used to develop the JMF shall meet the requirements of the NJDOTSS. A certification signed by the manager of the laboratory stating that it meets these requirements or clearly listing all deficiencies shall be submitted to the Contracting Officer prior to the start of construction.

The certification shall contain as a minimum:

- a. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.
- b. A listing of equipment to be used in developing the job mix.

c. A copy of the laboratory's quality control system.

d. Evidence of participation in the AASHTO Materials Reference Laboratory (AMRL) program.

### 3.7 TRANSPORTING AND PLACING

#### 3.7.1 Transporting

The hot-mix asphalt shall be transported from the mixing plant to the site in clean, tight vehicles. Deliveries shall be scheduled so that placing and compacting of mixture is uniform with minimum stopping and starting of the paver. Adequate artificial lighting shall be provided for night placements. Hauling over freshly placed material will not be permitted until the material has been compacted as specified, and allowed to cool to 140 degrees F. To deliver mix to the paver, the Contractor shall use a material transfer vehicle which shall be operated to produce continuous forward motion of the paver.

#### 3.7.2 Placing

The mix shall be placed and compacted at a temperature suitable for obtaining density, surface smoothness, and other specified requirements of the NJDOTSS.

### 3.8 COMPACTION OF MIXTURE

After placing, the mixture shall be thoroughly and uniformly compacted by rolling and shall conform to the requirements of NJDOTSS Section 404. The surface shall be compacted as soon as possible without causing displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once. Rolling shall continue until the surface is of uniform texture, true to grade and cross section, and the required field density is obtained. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened but excessive water shall not be permitted. In area not accessible to the roller, the mixture shall be thoroughly compacted with hand tampers. Any mixture that becomes loose and broken, mixed with dirt, contains check-cracking, or is in any way defective shall be removed full depth, replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. The work shall be done at the Contractor's expense. skin patching will not be allowed.

### 3.9 JOINTS

The formation of joints shall be made ensuring a continuous bond between the courses and to obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

### 3.9.1 Transverse Joints

The roller shall not pass over the unprotected end of the freshly laid mixture, except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing material at the joint. The cutback material shall be removed from the project. In both methods, all contact surfaces shall be given a light tack coat of asphalt material before placing any fresh mixture against the joint.

### 3.9.2 Longitudinal Joints

Longitudinal joints which are irregular, damaged, uncompacted, cold (less than 175 degrees F at the time of placing adjacent lanes), or otherwise defective, shall be cut back a minimum of 2 inches from the edge with a cutting wheel to expose a clean, sound vertical surface for the full depth of the course. All cutback material shall be removed from the project. All contact surfaces shall be given a light tack coat of asphalt material prior to placing any fresh mixture against the joint. The Contractor will be allowed to use an alternate method if it can be demonstrated that density, smoothness, and texture can be met.

## 3.10 CONTRACTOR QUALITY CONTROL

### 3.10.1 General Quality Control Requirements

The Contractor shall develop an approved Quality Control Plan. Hot-mix asphalt for payment shall not be produced until the quality control plan has been approved. The plan shall address all elements which affect the quality of the pavement including, but not limited to:

- a. Mix Design
- b. Aggregate Grading
- c. Quality of Materials
- d. Stockpile Management
- e. Proportioning
- f. Mixing and Transportation
- g. Mixture Volumetrics
- h. Moisture Content of Mixtures
- i. Placing and Finishing
- j. Joints

k. Compaction

1.Surface Smoothness

3.11 MATERIAL ACCEPTANCE AND PERCENT PAYMENT

Testing for acceptability of work will be performed by an independent laboratory hired by the Contractor. Test results and payment calculations shall be forwarded daily to the Contracting Officer. Acceptance of the plant produced mix and in-place requirements will be on a lot to lot basis.

The acceptance of the lot will meet the requirements of the NJDOTSS Section 404. In order to evaluate laboratory air voids and in-place (field) density, each lot will be divided into four equal sublots.

3.11.1 Percent Payment

Percent payment will be based on the requirements in the NJDOTSS Section 404.

3.11.2 In-place Density

3.11.2.1 General Density Requirements

General density requirements will be based on the requirements in the NJDOTSS Section 404.

3.11.2.2 Mat and Joint Densities

Mat and joint densities will be based on the requirements in NJDOTSS Section 404.

3.11.3 Grade

Grade will conform to the requirements in the NJDOTSS Section 404.

3.11.4 Surface Smoothness

Surface smoothness will conform to the requirements in the NJDOTSS Section 404.

-- End of Section --

## SECTION 02748

BITUMINOUS TACK AND PRIME COATS  
01/98

Item No. 41c - Tack Coat  
Item No. 41d - Prime Coat

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M 20	(1970) Penetration Graded Asphalt Cement
AASHTO M 81	(1992) Cut-Back Asphalt (Rapid-Curing Type)
AASHTO M 82	(1975) Cut-Back Asphalt (Medium-Curing Type)
AASHTO M 226	(1980) Viscosity Graded Asphalt Cement
AASHTO T 40	(1978; R 1983) Sampling Bituminous Materials

## AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

ASTM D 140	(1993) Sampling Bituminous Materials
ASTM D 946	(1982; R 1993) Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D 977	(1991) Emulsified Asphalt
ASTM D 1250	(1980; R 1990) Petroleum Measurement Tables
ASTM D 2026	(1972; R 1993) Cutback Asphalt (Slow-Curing Type)
ASTM D 2027	(1976; R 1992) Cutback Asphalt (Medium-Curing Type)
ASTM D 2028	(1976; R 1992) Cutback Asphalt (Rapid-Curing Type)
ASTM D 2397	(1994) Cationic Emulsified Asphalt

ASTM D 2995	(1993) Determining Application Rate of Bituminous Distributors
ASTM D 3381	(1992) Viscosity-Graded Asphalt Cement for Use in Pavement Construction

NEW JERSEY DEPARTMENT OF TRANSPORTATION (NJDOT)

Standard Specification for Road and Bridge Construction

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-09 Reports

Tests.

Copies of all test results for bituminous materials, within 24 hours of completion of tests. Certified copies of the manufacturer's test reports indicating compliance with applicable specified requirements, not less than 30 days before the material is required in the work.

SD-18 Records

Waybills and Delivery Tickets.

Waybills and delivery tickets, during progress of the work.

1.3 PLANT, EQUIPMENT, MACHINES AND TOOLS

1.3.1 General Requirements

Plant, equipment, machines and tools used in the work shall be subject to approval and shall be maintained in a satisfactory working condition at all times.

1.3.2 Bituminous Distributor

The distributor shall conform to the requirements of NJDOT Standard Specification, Subsection 402.03.

1.3.3 Power Brooms and Power Blowers

Power brooms and power blowers shall be suitable for cleaning the surfaces to which the bituminous coat is to be applied.

1.4 WEATHER LIMITATIONS



Bituminous coat shall be applied only when the surface to receive the bituminous coat is dry. Bituminous coat shall be applied only when the atmospheric temperature in the shade is 50 degrees F or above and when the temperature has not been below 35 degrees F for the 12 hours prior to application.

## PART 2 PRODUCTS

### 2.1 TACK COAT

Tack Coat shall conform to requirements of NJDOT Standard Specification, Subsection 404.02.

### 2.2 PRIME COAT

Prime Coat shall conform to requirements of NJDOT Standard Specification, Subsection 402.02.

## PART 3 EXECUTION

### 3.1 PREPARATION OF SURFACE

Immediately before applying the bituminous coat, all loose material, dirt, clay, or other objectionable material shall be removed from the surface to be treated. The surface shall be dry and clean at the time of treatment.

### 3.2 APPLICATION RATE

The exact quantities within the range specified, which may be varied to suit field conditions, will be determined by the Contracting Officer.

#### 3.2.1 Tack Coat

Bituminous material for the tack coat shall be applied in quantities in accordance to NJDOT Standard Specification, Subsection 404.02.

#### 3.2.2 Prime Coat

Bituminous material for the prime coat shall be applied in quantities in accordance to NJDOT Standard Specification, Subsection 404.02.

### 3.3 APPLICATION TEMPERATURE

#### 3.3.1 Viscosity Relationship

Asphalt application temperature shall provide an application viscosity between 10 and 60 seconds, Saybolt Furol, or between 20 and 120 centistokes, kinematic. The temperature viscosity relation shall be furnished to the Contracting Officer.

#### 3.3.2 Temperature Ranges

The viscosity requirements shall determine the application temperature to

be used. The application temperature will conform to the requirements in the NJDOT Standard Specification, Section 404.

### 3.4 APPLICATION

Following preparation and subsequent inspection of the surface, the bituminous coat shall be applied at the specified rate with uniform distribution over the surface to be treated. All areas and spots missed by the distributor shall be properly treated with the hand spray. Until the succeeding layer of pavement is placed, the surface shall be maintained by protecting the surface against damage and by repairing deficient areas at no additional cost to the Government. If required, clean dry sand shall be spread to effectively blot up any excess bituminous material. No smoking, fires, or flames other than those from the heaters that are a part of the equipment shall be permitted within 25 feet of heating, distributing, and transferring operations of bituminous material other than bituminous emulsions. To obtain uniform application of the prime coat on the surface treated at the junction of previous and subsequent applications, building paper shall be spread on the surface for a sufficient distance back from the ends of each application to start and stop the prime coat on the paper.

Immediately after application, the building paper shall be removed and destroyed.

### 3.5 CURING PERIOD

Following application of the bituminous material and prior to application of the succeeding layer of pavement, the bituminous coat shall be allowed to cure and to obtain evaporation of any volatiles or moisture. Prime coat shall be allowed to cure without being disturbed for a period of at least 48 hours or longer, as may be necessary to attain penetration into the treated course.

### 3.6 FIELD QUALITY CONTROL

Samples of the bituminous material used shall be obtained by the Contractor as directed, under the supervision of the Contracting Officer. The sample may be retained and tested by the Government at no cost to the Contractor.

### 3.7 SAMPLING AND TESTING

Sampling and testing shall be performed by an approved commercial testing laboratory or by facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been inspected and approved.

#### 3.7.1 Sampling

The samples of bituminous material, unless otherwise specified, shall be in accordance with ASTM D 140 or AASHTO T 40 and NJDOT Standard Specification.

Sources from which bituminous materials are to be obtained shall be selected and notification furnished the Contracting Officer within 15 days after the award of the contract.

#### 3.7.2 Calibration Test

The Contractor shall furnish all equipment, materials, and labor necessary to calibrate the bituminous distributor. Calibration shall be made with the approved job material and prior to applying the bituminous coat material to the prepared surface. Calibration of the bituminous distributor shall be in accordance with ASTM D 2995.

### 3.7.3 Trial Applications

Before providing the complete bituminous coat, three lengths of at least 100 feet for the full width of the distributor bar shall be applied to evaluate the amount of bituminous material that can be satisfactorily applied.

#### 3.7.3.1 Tack Coat Trial Application Rate

Unless otherwise authorized, the trial application rate of bituminous tack coat materials shall be applied in the amount of 0.05 gallons per square yard. Other trial applications shall be made using various amounts of material as may be deemed necessary.

#### 3.7.3.2 Prime Coat Trial Application Rate

Unless otherwise authorized, the trial application rate of bituminous materials shall be applied in the amount of 0.25 gallon per square yard. Other trial applications shall be made using various amounts of material as may be deemed necessary.

### 3.7.4 Sampling and Testing During Construction

Quality control sampling and testing shall be performed as required in paragraph FIELD QUALITY CONTROL.

-- End of Section --

## SECTION 02770

## CONCRETE SIDEWALK AND CURBS

03/98

Item No. 51 - 9"x18" Concrete Vertical Curb

Item No. 52 - Concrete Sidewalk, 14" Thick

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M 182 (1991) Burlap Cloth Made from Jute or Kenaf

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185 (1997) Steel Welded Wire Fabric, Plain,  
for Concrete Reinforcement

ASTM A 615/A 615M (1996a) Deformed and Plain Billet-Steel  
Bars for Concrete Reinforcement

ASTM A 616/A 616M (1996a) Rail-Steel Deformed and Plain Bars  
for Concrete Reinforcement

ASTM A 617/A 617M (1996a) Axle-Steel Deformed and Plain Bars  
for Concrete Reinforcement

ASTM C 31/C 31M (1996) Making and Curing Concrete Test  
Specimens in the Field

ASTM C 143 (1990a) Slump of Hydraulic Cement Concrete

ASTM C 171 (1997) Sheet Materials for Curing Concrete

ASTM C 172 (1997) Sampling Freshly Mixed Concrete

ASTM C 173 (1996) Air Content of Freshly Mixed  
Concrete by the Volumetric Method

ASTM C 231 (1997) Air Content of Freshly Mixed  
Concrete by the Pressure Method

ASTM C 309 (1997) Liquid Membrane-Forming Compounds  
for Curing Concrete

ASTM C 920	(1995) Elastomeric Joint Sealants
ASTM D 1751	(1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1996) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 3405	(1996) Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements

#### NEW JERSEY DEPARTMENT OF TRANSPORTATION

NJDOT	(1989) Standard Specifications for Roads and Bridges Construction
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### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-09 Reports

Field Quality Control.

Copies of all test reports within 24 hours of completion of the test.

#### SD-18 Records

Concrete.

Copies of certified delivery tickets for all concrete used in the construction.

### 1.3 WEATHER LIMITATIONS

#### 1.3.1 Placing During Cold Weather

Concrete placement shall not take place when the air temperature reaches 40 degrees F and is falling, or is already below that point. Placement may begin when the air temperature reaches 35 degrees F and is rising, or is already above 40 degrees F. Provisions shall be made to protect the concrete from freezing during the specified curing period. If necessary to place concrete when the temperature of the air, aggregates, or water is below 35 degrees F, placement and protection shall be approved in writing.

Approval will be contingent upon full conformance with the following provisions. The underlying material shall be prepared and protected so that it is entirely free of frost when the concrete is deposited. Mixing water and aggregates shall be heated as necessary to result in the

temperature of the in-place concrete being between 50 and 85 degrees F. Methods and equipment for heating shall be approved. The aggregates shall be free of ice, snow, and frozen lumps before entering the mixer. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period.

#### 1.3.2 Placing During Warm Weather

The temperature of the concrete as placed shall not exceed 85 degrees F except where an approved retarder is used. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. The placing temperature shall not exceed 95 degrees F at any time.

### 1.4 PLANT, EQUIPMENT, MACHINES, AND TOOLS

#### 1.4.1 General Requirements

Plant, equipment, machines, and tools used in the work shall be subject to approval and shall be maintained in a satisfactory working condition at all times. The equipment shall have the capability of producing the required product, meeting grade controls, thickness control and smoothness requirements as specified. Use of the equipment shall be discontinued if it produces unsatisfactory results. The Contracting Officer shall have access at all times to the plant and equipment to ensure proper operation and compliance with specifications.

#### 1.4.2 Slip Form Equipment

Slip form paver or curb forming machine, will be approved based on trial use on the job and shall be self-propelled, automatically controlled, crawler mounted, and capable of spreading, consolidating, and shaping the plastic concrete to the desired cross section in 1 pass.

## PART 2 PRODUCTS

### 2.1 CONCRETE

Concrete shall conform to the applicable requirements of Section NJDOT STANDARD SPECIFICATIONS SECTION 607 and 914 except as otherwise specified. Concrete shall have a minimum compressive strength of 3500 psi at 28 days. Maximum size of aggregate shall be 1-1/2 inches.

#### 2.1.1 Air Content

Mixtures shall have air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.

#### 2.1.2 Slump

The concrete slump shall be 2 inches plus or minus 1 inch where determined in accordance with ASTM C 143.

### 2.1.3 Reinforcement Steel

Reinforcement bars shall conform to ASTM A 615/A 615M, ASTM A 616/A 616M, or ASTM A 617/A 617M. Wire mesh reinforcement shall conform to ASTM A 185.

## 2.2 CONCRETE CURING MATERIALS

### 2.2.1 Impervious Sheet Materials

Impervious sheet materials shall conform to ASTM C 171, type optional, except that polyethylene film, if used, shall be white opaque.

### 2.2.2 Burlap

Burlap shall conform to AASHTO M 182.

### 2.2.3 White Pigmented Membrane-Forming Curing Compound

White pigmented membrane-forming curing compound shall conform to ASTM C 309, Type 2.

## 2.3 CONCRETE PROTECTION MATERIALS

Concrete protection materials shall be a linseed oil mixture of equal parts, by volume, of linseed oil and either mineral spirits, naphtha, or turpentine. At the option of the contractor, commercially prepared linseed oil mixtures, formulated specifically for application to concrete to provide protection against the action of deicing chemicals may be used, except that emulsified mixtures are not acceptable.

## 2.4 JOINT FILLER STRIPS

### 2.4.1 Contraction Joint Filler for Curb and Gutter

Contraction joint filler for curb and gutter shall consist of hard-pressed fiberboard.

### 2.4.2 Expansion Joint Filler, Premolded

Expansion joint filler, premolded, shall conform to ASTM D 1751 or ASTM D 1752, 3/8 inch thick, unless otherwise indicated.

## 2.5 JOINT SEALANTS

### 2.5.1 Joint Sealant, Cold-Applied

Joint sealant, cold-applied shall conform to ASTM C 920.

### 2.5.2 Joint Sealant, Hot-Poured

Joint sealant, hot-poured shall conform to ASTM D 3405.

## 2.6 FORM WORK

Form work shall be designed and constructed to ensure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Forms shall be of wood or steel, straight, of sufficient strength to resist springing during depositing and consolidating concrete. Wood forms shall be surfaced plank, 2 inches nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Wood forms shall have a nominal length of 10 feet. Radius bends may be formed with 3/4 inch boards, laminated to the required thickness. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Ends of steel forms shall be interlocking and self-aligning. Steel forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers. Steel forms shall have a nominal length of 10 feet with a minimum of 3 welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips designed for use with steel forms.

#### 2.6.1 Sidewalk Forms

Sidewalk forms shall be of a height equal to the full depth of the finished sidewalk.

#### 2.6.2 Curb

Curb outside forms shall have a height equal to the full depth of the curb or gutter. The inside form of curb shall have batter as indicated and shall be securely fastened to and supported by the outside form. Rigid forms shall be provided for curb returns, except that benders or thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 1-1/2 inch benders, for the full height of the curb, cleated together. In lieu of inside forms for curbs, a curb "mule" may be used for forming and finishing this surface, provided the results are approved.

### PART 3 EXECUTION

#### 3.1 SUBGRADE PREPARATION

The subgrade shall be constructed to the specified grade and cross section prior to concrete placement. Subgrade shall be placed and compacted in conformance with Section 02310 EARTHWORK.

##### 3.1.1 Sidewalk Subgrade

The subgrade shall be tested for grade and cross section with a template extending the full width of the sidewalk and supported between side forms.

##### 3.1.2 Curb Subgrade

The subgrade shall be tested for grade and cross section by means of a template extending the full width of the curb and gutter. The subgrade



shall be of materials equal in bearing quality to the subgrade under the adjacent pavement.

### 3.1.3 Maintenance of Subgrade

The subgrade shall be maintained in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed. The subgrade shall be prepared and protected to produce a subgrade free from frost when the concrete is deposited.

## 3.2 FORM SETTING

Forms shall be set to the indicated alignment, grade and dimensions. Forms shall be held rigidly in place by a minimum of 3 stakes per form placed at intervals not to exceed 4 feet. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Clamps, spreaders, and braces shall be used where required to ensure rigidity in the forms. Forms shall be removed without injuring the concrete. Bars or heavy tools shall not be used against the concrete in removing the forms. Any concrete found defective after form removal shall be promptly and satisfactorily repaired. Forms shall be cleaned and coated with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

### 3.2.1 Sidewalks

Forms for sidewalks shall be set with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 10 foot long section. After forms are set, grade and alignment shall be checked with a 10 foot straightedge. Forms shall have a transverse slope of 1/4 inch per foot with the low side adjacent to the roadway. Side forms shall not be removed for 12 hours after finishing has been completed.

### 3.2.2 Curbs

The forms of the front of the curb shall be removed not less than 2 hours nor more than 6 hours after the concrete has been placed. Forms back of curb shall remain in place until the face and top of the curb have been finished, as specified for concrete finishing.

## 3.3 SIDEWALK CONCRETE PLACEMENT AND FINISHING

### 3.3.1 Formed Sidewalks

Concrete shall be placed in the forms in one layer. When consolidated and finished, the sidewalks shall be of the thickness indicated. After concrete has been placed in the forms, a strike-off guided by side forms shall be used to bring the surface to proper section to be compacted. The concrete shall be consolidated with an approved vibrator, and the surface shall be finished to grade with a strike off.

### 3.3.2 Concrete Finishing

After straightedging, when most of the water sheen has disappeared, and just before the concrete hardens, the surface shall be finished with a wood float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. A scored surface shall be produced by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.

### 3.3.3 Edge and Joint Finishing

All slab edges, including those at formed joints, shall be finished with an edger having a radius of 1/8 inch. Transverse joint shall be edged before brooming, and the brooming shall eliminate the flat surface left by the surface face of the edger. Corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing shall be cleaned and filled solidly with a properly proportioned mortar mixture and then finished.

### 3.3.4 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 5/16 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

## 3.4 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

### 3.4.1 Formed Curb

Concrete shall be placed to the section required in a single lift. Consolidation shall be achieved by using approved mechanical vibrators. Curve shaped gutters shall be finished with a standard curb "mule".

### 3.4.2 Curb Finishing

Approved slipformed curb machines may be used in lieu of hand placement.

### 3.4.3 Concrete Finishing

Exposed surfaces shall be floated and finished with a smooth wood float until true to grade and section and uniform in texture. Floated surfaces shall then be brushed with a fine-hair brush with longitudinal strokes. The edges of the gutter and top of the curb shall be rounded with an edging tool to a radius of 1/2 inch. Immediately after removing the front curb form, the face of the curb shall be rubbed with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. The front curb surface, while still wet, shall be brushed in the same manner as the gutter and curb top. The top surface of gutter and entrance shall be finished to grade with a wood float.

### 3.4.4 Joint Finishing

Curb edges at formed joints shall be finished as indicated.

### 3.4.5 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

### 3.5 SIDEWALK JOINTS

Sidewalk joints shall be constructed to divide the surface into rectangular areas. Transverse contraction joints shall be spaced at a distance equal to the sidewalk width or 5 feet on centers, whichever is less, and shall be continuous across the slab. Longitudinal contraction joints shall be constructed along the centerline of all sidewalks 10 feet or more in width. Transverse expansion joints shall be installed at sidewalk returns and opposite expansion joints in adjoining curbs. Where the sidewalk is not in contact with the curb, transverse expansion joints shall be installed as indicated. Expansion joints shall be formed about structures and features which project through or into the sidewalk pavement, using joint filler of the type, thickness, and width indicated.

#### 3.5.1 Sidewalk Contraction Joints

The contraction joints shall be formed in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness, using a jointer to cut the groove, or by sawing a groove in the hardened concrete with a power-driven saw, unless otherwise approved. Sawed joints shall be constructed by sawing a groove in the concrete with a 1/8 inch blade to the depth indicated. An ample supply of saw blades shall be available on the job before concrete placement is started, and at least one standby sawing unit in good working order shall be available at the jobsite at all times during the sawing operations.

#### 3.5.2 Sidewalk Expansion Joints

Expansion joints shall be formed with 1/2inch joint filler strips. Joint filler shall be placed with top edge 1/4 inch below the surface and shall be held in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool having a radius of 1/8 inch, and concrete over the joint filler shall be removed. At the end of the curing period, expansion joints shall be cleaned and filled with joint sealant. The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing material shall not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 50 degrees F at the time of application of joint sealing material.

Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

#### 3.5.3 Reinforcement Steel Placement

Reinforcement steel shall be accurately and securely fastened in place with suitable supports and ties before the concrete is placed.

### 3.6 CURB JOINTS

Curb joints shall be constructed at right angles to the line of curb.

#### 3.6.1 Contraction Joints

Contraction joints shall be constructed directly opposite contraction joints in abutting portland cement concrete pavements and spaced so that monolithic sections between curb returns will not be less than 5 feet nor greater than 15 feet in length. Contraction joints shall be constructed by means of 1/8 inch thick separators and of a section conforming to the cross section of the curb and gutter. Separators shall be removed as soon as practicable after concrete has set sufficiently to preserve the width and shape of the joint and prior to finishing.

#### 3.6.2 Expansion Joints

Expansion joints shall be formed by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Expansion joints shall be provided in curb and gutter directly opposite expansion joints of abutting portland cement concrete pavement, and shall be of the same type and thickness as joints in the pavement. Where curb and gutter do not abut portland cement concrete pavement, expansion joints at least 1/2 inch in width shall be provided at intervals not exceeding 10 feet. Expansion joints shall be provided in nonreinforced concrete gutter at locations indicated. Expansion joints shall be sealed immediately following curing of the concrete or as soon thereafter as weather conditions permit. Expansion joints and the top 1 inch depth of curb contraction-joints shall be sealed with joint sealant. The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing material shall not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 50 degrees F at the time of application of joint sealing material. Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

### 3.7 CURING AND PROTECTION

#### 3.7.1 General Requirements

Concrete shall be protected against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Unhardened concrete shall be protected from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready for use before actual concrete placement begins. Protection shall be provided as necessary to prevent cracking of the pavement due to temperature changes during the curing period.

##### 3.7.1.1 Mat Method

The entire exposed surface shall be covered with 2 or more layers of burlap. Mats shall overlap each other at least 6 inches. The mat shall be thoroughly wetted with water prior to placing on concrete surface and shall be kept continuously in a saturated condition and in intimate contact with

concrete for not less than 7 days.

#### 3.7.1.2 Impervious Sheeting Method

The entire exposed surface shall be wetted with a fine spray of water and then covered with impervious sheeting material. Sheets shall be laid directly on the concrete surface with the light-colored side up and overlapped 12 inches when a continuous sheet is not used. The curing medium shall not be less than 18-inches wider than the concrete surface to be cured, and shall be securely weighted down by heavy wood planks, or a bank of moist earth placed along edges and laps in the sheets. Sheets shall be satisfactorily repaired or replaced if torn or otherwise damaged during curing. The curing medium shall remain on the concrete surface to be cured for not less than 7 days.

#### 3.7.1.3 Membrane Curing Method

A uniform coating of white-pigmented membrane-curing compound shall be applied to the entire exposed surface of the concrete as soon after finishing as the free water has disappeared from the finished surface. Formed surfaces shall be coated immediately after the forms are removed and in no case longer than 1 hour after the removal of forms. Concrete shall not be allowed to dry before the application of the membrane. If any drying has occurred, the surface of the concrete shall be moistened with a fine spray of water and the curing compound applied as soon as the free water disappears. Curing compound shall be applied in two coats by hand-operated pressure sprayers at a coverage of approximately 200 square feet per gallon for the total of both coats. The second coat shall be applied in a direction approximately at right angles to the direction of application of the first coat. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. If pinholes, abrasion, or other discontinuities exist, an additional coat shall be applied to the affected areas within 30 minutes. Concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied shall be resprayed by the method and at the coverage specified above. Areas where the curing compound is damaged by subsequent construction operations within the curing period shall be resprayed. Necessary precautions shall be taken to insure that the concrete is properly cured at sawed joints, and that no curing compound enters the joints. The top of the joint opening and the joint groove at exposed edges shall be tightly sealed before the concrete in the region of the joint is resprayed with curing compound. The method used for sealing the joint groove shall prevent loss of moisture from the joint during the entire specified curing period. Approved standby facilities for curing concrete pavement shall be provided at a location accessible to the jobsite for use in the event of mechanical failure of the spraying equipment or other conditions that might prevent correct application of the membrane-curing compound at the proper time. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected during the entire curing period from pedestrian and vehicular traffic, except as required for joint-sawing operations and surface tests, and from any other possible damage to the continuity of the membrane.

### 3.7.2 Backfilling

After curing, debris shall be removed and the area adjoining the concrete shall be backfilled, graded, and compacted to conform to the surrounding area in accordance with lines and grades indicated.

### 3.7.3 Protection

Completed concrete shall be protected from damage until accepted. The Contractor shall repair damaged concrete and clean concrete discolored during construction. Concrete that is damaged shall be removed and reconstructed for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Removed damaged portions shall be disposed of as directed.

### 3.7.4 Protective Coating

Protective coating of linseed oil mixture shall be applied to the exposed-to-view concrete surface.

#### 3.7.4.1 Application

Curing and backfilling operation shall be completed prior to applying two coats of protective coating. Concrete shall be surface dry and clean before each application. Coverage shall be by spray application at not more than 50 square yards per gallon for first application and not more than 70 square yards per gallon for second application, except that the number of applications and coverage for each application for commercially prepared mixture shall be in accordance with the manufacturer's instructions. Coated surfaces shall be protected from vehicular and pedestrian traffic until dry.

#### 3.7.4.2 Precautions

Protective coating shall not be heated by direct application of flame or electrical heaters and shall be protected from exposure to open flame, sparks, and fire adjacent to open containers or applicators. Material shall not be applied at ambient or material temperatures lower than 50 degrees F.

## 3.8 FIELD QUALITY CONTROL

### 3.8.1 General Requirements

The Contractor shall perform the inspection and tests described and meet the specified requirements for inspection details and frequency of testing.

Based upon the results of these inspections and tests, the Contractor shall take the action and submit reports as required below, and any additional tests to insure that the requirements of these specifications are met.

### 3.8.2 Concrete Testing

#### 3.8.2.1 Strength Testing

The Contractor shall provide molded concrete specimens for strength tests. Samples of concrete placed each day shall be taken not less than once a day nor less than once for every 250 cubic yards of concrete. The samples for strength tests shall be taken in accordance with ASTM C 172. Cylinders for acceptance shall be molded in conformance with ASTM C 31/C 31M by an approved testing laboratory. Each strength test result shall be the average of 2 test cylinders from the same concrete sample tested at 28 days, unless otherwise specified or approved. Concrete specified on the basis of compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength, and no individual strength test result falls below the specified strength by more than 500 psi.

#### 3.8.2.2 Air Content

Air content shall be determined in accordance with ASTM C 173 or ASTM C 231.

ASTM C 231 shall be used with concretes and mortars made with relatively dense natural aggregates. Two tests for air content shall be made on randomly selected batches of each class of concrete placed during each shift. Additional tests shall be made when excessive variation in concrete workability is reported by the placing foreman or the Government inspector.

If results are out of tolerance, the placing foreman shall be notified and he shall take appropriate action to have the air content corrected at the plant. Additional tests for air content will be performed on each truckload of material until such time as the air content is within the tolerance specified.

#### 3.8.2.3 Slump Test

Two slump tests shall be made on randomly selected batches of each class of concrete for every 250 cubic yards, or fraction thereof, of concrete placed during each shift. Additional tests shall be performed when excessive variation in the workability of the concrete is noted or when excessive crumbling or slumping is noted along the edges of slip-formed concrete.

#### 3.8.3 Thickness Evaluation

The anticipated thickness of the concrete shall be determined prior to placement by passing a template through the formed section or by measuring the depth of opening of the extrusion template of the curb forming machine.

If a slip form paver is used for sidewalk placement, the subgrade shall be true to grade prior to concrete placement and the thickness will be determined by measuring each edge of the completed slab.

#### 3.8.4 Surface Evaluation

The finished surface of each category of the completed work shall be uniform in color and free of blemishes and form or tool marks.

### 3.9 SURFACE DEFICIENCIES AND CORRECTIONS

#### 3.9.1 Thickness Deficiency

When measurements indicate that the completed concrete section is deficient in thickness by more than 1/4 inch the deficient section will be removed, between regularly scheduled joints, and replaced.

### 3.9.2 High Areas

In areas not meeting surface smoothness and plan grade requirements, high areas shall be reduced either by rubbing the freshly finished concrete with carborundum brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine after the concrete is 36 hours old or more. The area corrected by grinding the surface of the hardened concrete shall not exceed 5 percent of the area of any integral slab, and the depth of grinding shall not exceed 1/4 inch.

Pavement areas requiring grade or surface smoothness corrections in excess of the limits specified above shall be removed and replaced.

### 3.9.3 Appearance

Exposed surfaces of the finished work will be inspected by the Government and any deficiencies in appearance will be identified. Areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the work shall be removed and replaced.

-- End of Section --



## SECTION 02810

## ARCHAEOLOGICAL MONITORING

Item No. 17a	Archeological Monitoring:	Coordination Meeting
Item No. 17b	Archeological Monitoring:	Excavation
Item No. 17c	Archeological Monitoring:	Standby Time
Item No. 17d	Archeological Monitoring:	Secure and Open Trenches

## PART 1 GENERAL

## 1.1 DESCRIPTION

Work covered in this Section includes all activities associated with providing assistance to the project archaeologist in accomplishing the Archaeological Monitoring that is required for this project, and as described herein.

## 1.2 TERMINOLOGY

## 1.2.1 Archaeological Monitoring

The observations of construction excavation activities by an archaeologist in order to identify, recover, protect and/or document archaeological information or materials.

## 1.3 AREAS OF RESPONSIBILITY

## 1.3.1 Contractor

The earthmoving equipment, operating personnel, and performance of the required excavations are under the control of the construction contractor. Limited clearing may also be required. The contractor shall coordinate and cooperate with the project archaeologist as required.

## 1.3.2 Archaeologist

The excavation areas, locations and depths are under the control of the archaeologist and reviewing agency. The anticipated excavation areas, locations, and depths are established in this Specification. The archaeologist is given authority to identify areas where additional archeological excavation is required, beyond those areas identified in the Contract Documents, in response to field conditions and/or based on interim monitoring results. The Contracting Officer must specifically authorize any additional areas of excavation. If excavation of identified sites will interfere with the contractor's progress, the Contracting Officer must approve the archaeologist's direction.

## 1.4 NATURE OF THE ARCHAEOLOGICAL WORK

The project archaeologist shall enter the trench to record soil profiles

through photography, drawings and notes. Cultural material, if present, will be collected and bagged appropriately for identification and curation.

Limited screening of the soil removed from the trenches may be undertaken.

Based on background research there is the potential for the remains of a historic millrace to be encountered in the project area. The results of the archaeological monitoring will be presented in a written report which will be coordinated with the New Jersey Historic Preservation Office.

#### 1.5 ACTIONS TO BE TAKEN BY ARCHAEOLOGIST SHOULD REMAINS REQUIRING FURTHER STUDY BE ENCOUNTERED

Should significant materials or features be identified and it is determined by the project archaeologist that further investigation of the area is required the project archaeologist, contractor and Contracting Officer shall meet to determine the level of effort and time anticipated. The project archaeologist or Contracting Officer shall coordinate this effort with the New Jersey Historic Preservation Office. Additional work may include additional clearing and the excavation of additional trenches.

Delay in construction related to the need for further archaeological investigation and coordination might require a Change Order for the contract and require that the contractor be compensated above and beyond the defined unit prices.

#### PART 2 PRODUCTS (Not Applicable)

#### PART 3 EXECUTION

##### 3.1 COORDINATION MEETING WITH PROJECT ARCHAEOLOGIST

Prior to initiating construction, the contractor shall arrange and attend a meeting with the project archaeologist and other interested project parties. The purpose of this meeting, at a minimum, will be to review the following:

- Requirements and objectives of the archaeology monitoring plan.
- Archaeologist and contractor areas of responsibility.
- Authority of the archaeologist while on-site during construction.

##### 3.2 ANTICIPATED EXCAVATION REQUIREMENTS

###### 3.2.1 The anticipated excavation requirements are summarized below:

Number of Trenches:	3
Trench Width:	3 to 4 feet
Trench Depth:	4 to 8 feet
Trench Side Slopes:	as required for safe excavation, as determined by the Contractor
Trench Length:	up to 30 feet (documentary evidence suggest that a raceway, if present, would measure approximately 10 feet in width but may be located anywhere within the 30 foot wide property bounds).
Trench Locations:	as directed by archaeologist
Time Requirements:	each trench shall be made available for monitoring

for a minimum of 2 hours

### 3.3 POSSIBLE EXCAVATION SEQUENCING PLAN

The following identifies one possible sequencing plan for accomplishing the required archaeology monitoring. This sequencing plan is provided for information only and may be adjusted by the project archaeologist prior to initiating construction.

- At the direction of the archaeologist, the contractor will excavate two (2) trenches first thing in the morning.
- Once the trenches are excavated, the contractor will proceed with other construction activities at the site. The archaeologist shall arrange the archeology monitoring work schedule to avoid any interference with the contractor while the investigations are underway.
- At the direction of the archaeologist, the contractor will backfill the two (2) trenches. If one or more trenches need to remain open overnight to allow responsible archaeological investigation, the contractor will secure the trenches at the end of the day and provide access for continued archaeological monitoring the morning of the following day.
- At the direction of archaeologist, the remaining trench will be excavated utilizing a similar approach.

-- End of Section --

## SECTION 02821A

FENCING  
02/02

Item no. 46 - Chain Link Fence

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 116	(2000) Metallic-Coated, Steel Woven Wire Fence Fabric
ASTM A 121	(1999) Zinc-Coated (Galvanized) Steel Barbed Wire
ASTM A 153/A 153M	(2001) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 176	(1999) Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
ASTM A 392	(1996) Zinc-Coated Steel Chain-Link Fence Fabric
ASTM A 478	(1997) Chromium-Nickel Stainless Steel Weaving and Knitting Wire
ASTM A 491	(1996) Aluminum-Coated Steel Chain-Link Fence Fabric
ASTM A 585	(1997) Aluminum-Coated Steel Barbed Wire
ASTM A 666	(2000) Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
ASTM A 702	(1989; R 1994el) Steel Fence Posts and Assemblies, Hot Wrought
ASTM A 780	(2000) Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings
ASTM A 824	(1995) Metallic-Coated Steel Marcellled Tension Wire for Use With Chain Link Fence

ASTM C 94/C 94M	(2000e2) Ready-Mixed Concrete
ASTM D 4541	(1995e1) Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM F 1043	(2000) Strength and Protective Coatings on Metal Industrial Chain-Link Fence Framework
ASTM F 1083	(1997) Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
ASTM F 1184	(1994) Industrial and Commercial Horizontal Slide Gates
ASTM F 626	(1996a) Fence Fittings
ASTM F 668	(1999a) Poly(Vinyl Chloride) (PVC)-Coated Steel Chain-Link Fence Fabric
ASTM F 883	(1997) Padlocks
ASTM F 900	(1994) Industrial and Commercial Swing Gates
ASTM G 23	(1996) Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials
ASTM G 26	(1996) Operating Light-Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials
ASTM G 53	(1996) Operating Light- and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

AWPA C1	(2000) All Timber Products - Preservative Treatment by Pressure Processes
AWPA C4	(1999) Poles - Preservative Treatment by Pressure Processes

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-07 Certificates

## Chain Link Fence; G

Statement, signed by an official authorized to certify on behalf of the manufacturer, attesting that the chain link fence and component materials meet the specified requirements.

## 1.3 APPROVAL OF POLYVINYL CHLORIDE-COATED FENCE MATERIALS

Polyvinyl chloride-coated fence materials shall be thoroughly inspected for cracking, peeling, and conformance with the specifications by the Contracting Officer's Representative prior to installation. Any fence materials rejected by the Contracting Officer's Representative shall be replaced by the contractor with approved materials at no additional cost to the Government.

## PART 2 PRODUCTS

## 2.1 FENCE FABRIC

Fence fabric shall conform to the following:

## 2.1.1 Chain Link Fence Fabric

ASTM A 392, Class 2b polyvinyl chloride-coated steel fabric with 0.3 ounces of zinc coating per square foot in accordance with ASTM F 668. Fabric shall be fabricated of 9 gauge wire woven in 2 inch mesh. Polyvinyl chloride coating for fabric and all other fence components shall be manufacturer's standard black in color. Fabric height shall be 4 feet as shown. Fabric shall be twisted and barbed on the top selvage and knuckled on the bottom selvage.

## 2.2 POSTS

## 2.2.1 Metal Posts for Chain Link Fence

ASTM F 1083, zinc-coated. Group IA, with external coating Type A steel pipe. Group IC steel pipe, zinc-coated with external coating Type A or Type B and Group II, roll-formed steel sections, shall meet the strength and coating requirements of ASTM F 1043. Group III, ASTM F 1043 steel H-section may be used for line posts in lieu of line post shapes specified for the other classes. Post shall be Group IA steel pipe, and shall be zinc coated (Type A) and polyvinyl chloride coated conforming to the requirements of ASTM F 1043. Sizes shall be as shown on the drawings. Line posts and terminal (corner, gate, and pull) posts selected shall be of the same designation throughout the fence.

## 2.3 BRACES AND RAILS

ASTM F 1083, zinc-coated, Group IA, steel pipe, size NPS 1-1/4. Braces and rails shall be Group IA and shall be zinc coated (Type A) and polyvinyl chloride-coated conforming to the requirements of ASTM F 1043.

## 2.4 WIRE

### 2.4.1 Tension Wire

Tension wire shall be Type I or Type II, Class 2 coating, in accordance with ASTM A 824.

## 2.5 ACCESSORIES

ASTM F 626. Ferrous accessories shall be zinc or aluminum coated. Ferrous accessories shall also be polyvinyl chloride-coated, minimum thickness of 0.006 inch, maximum thickness of 0.015 inch. Color coating of fittings shall match the color coating of the fabric. Truss rods shall be furnished for each terminal post. Truss rods shall be provided with turnbuckles or other equivalent provisions for adjustment. Tie wires for attaching fabric to rails, braces, and posts shall be 9 gauge steel wire and match the coating of the fence fabric. The tie wires shall be a double loop and 6.5 inches in length. Miscellaneous hardware coatings shall conform to ASTM A 153/A 153M unless modified. Threaded hardware shall be painted to match polyvinyl chloride coatings.

## 2.6 CONCRETE

ASTM C 94/C 94M, using 3/4 inch maximum size aggregate, and having minimum compressive strength of 3000 psi at 28 days. Grout shall consist of one part portland cement to three parts clean, well-graded sand and the minimum amount of water to produce a workable mix.

## 2.7 GATE OPERATOR

Electric gate operators for sliding gates shall be as follows: Electrical gate operators shall have a right angle gearhead instantly reversing motor with magnetic drum-type brake, friction disc clutch, reversing starter with thermal overload protection, and a chain-driven geared rotary-type automatic limit switch. Gears shall consist of a hardened steel machine cut worm and mating bronze gear. All gears and bearings shall operate in a bath of oil. Gate operators with V-belt pulleys will not be allowed. Gate operators shall be equipped with an emergency release to allow the gate to be operated manually. The emergency release mechanism shall be capable of being locked in the engaged or disengaged position. Positive stops shall be provided on the gate tracks as a backup to the limit switches.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Fence shall be installed to the lines and grades indicated. The area on either side of the fence line shall be cleared to the extent indicated. Line posts shall be spaced equidistant at intervals not exceeding 10 feet. Terminal (corner, gate, and pull) posts shall be set at abrupt changes in vertical and horizontal alignment. Fabric shall be continuous between terminal posts; however, runs between terminal posts shall not exceed 500 feet. Any damage to galvanized surfaces, including welding, shall be repaired with paint containing zinc dust in accordance with ASTM A 780.

### 3.2 EXCAVATION

Post holes shall be cleared of loose material. Waste material shall be spread where directed. The ground surface irregularities along the fence line shall be eliminated to the extent necessary to maintain a 2 inch clearance between the bottom of the fabric and finish grade.

### 3.3 POST INSTALLATION

#### 3.3.1 Posts for Chain Link Fence

Posts shall be set plumb and in alignment. Posts shall be set in concrete to the depth indicated on the drawings. Posts set in concrete shall be set in holes not less than the diameter shown on the drawings. Concrete and grout shall be thoroughly consolidated around each post, shall be free of voids and finished to form a dome. Concrete and grout shall be allowed to cure for 72 hours prior to attachment of any item to the posts.

### 3.4 RAILS

#### 3.4.1 Top Rail

Top rail shall be supported at each post to form a continuous brace between terminal posts. Where required, sections of top rail shall be joined using sleeves or couplings that will allow expansion or contraction of the rail. Top rail, if required for high security fence, shall be installed as indicated on the drawings.

### 3.5 TENSION WIRES

Tension wires shall be installed along the bottom of the fence line and attached to the terminal posts of each stretch of the fence. Bottom tension wire shall be installed within the bottom 6 inches of the installed fabric. Tension wire shall be pulled taut and shall be free of sag.

### 3.6 CHAIN LINK FABRIC

Chain link fabric shall be installed on the side of the post indicated. Fabric shall be attached to terminal posts with stretcher bars and tension bands. Bands shall be spaced at approximately 15 inch intervals. The fabric shall be installed and pulled taut to provide a smooth and uniform appearance free from sag, without permanently distorting the fabric diamond or reducing the fabric height. Fabric shall be fastened to line posts at approximately 15 inch intervals and fastened to all rails and tension wires at approximately 24 inch intervals. Fabric shall be cut by untwisting and removing pickets. Splicing shall be accomplished by weaving a single picket into the ends of the rolls to be joined. The bottom of the installed fabric shall be 2 plus or minus 1/2 inch above the ground. For high security fence, after the fabric installation is complete, the fabric shall be exercised by applying a 50 pound push-pull force at the center of the fabric between posts; the use of a 30 pound pull at the center of the panel shall cause fabric deflection of not more than 2-1/2 inches when pulling fabric from the post side of the fence; every second fence panel



shall meet this requirement; all failed panels shall be resecured and retested at the Contractor's expense.

### 3.7 GROUNDING

Fences crossed by overhead powerlines in excess of 600 volts shall be grounded. Electrical equipment attached to the fence shall be grounded. Fences shall be grounded on each side of all gates, at each corner, at the closest approach to each building located within 50 feet of the fence, and where the fence alignment changes more than 15 degrees. Grounding locations shall not exceed 650 feet. Each gate panel shall be bonded with a flexible bond strap to its gate post. Fences crossed by powerlines of 600 volts or more shall be grounded at or near the point of crossing and at distances not exceeding 150 feet on each side of crossing. Ground conductor shall consist of No. 8 AWG solid copper wire. Grounding electrodes shall be 3/4 inch by 10 foot long copper-clad steel rod. Electrodes shall be driven into the earth so that the top of the electrode is at least 6 inches below the grade. Where driving is impracticable, electrodes shall be buried a minimum of 12 inches deep and radially from the fence. The top of the electrode shall be not less than 2 feet or more than 8 feet from the fence. Ground conductor shall be clamped to the fence and electrodes with bronze grounding clamps to create electrical continuity between fence posts, fence fabric, and ground rods. After installation the total resistance of fence to ground shall not be greater than 25 ohms.

-- End of Section --

## SECTION 03101

FORMWORK FOR CONCRETE  
12/92

## Item No. 9 - Concrete

## PART 1 GENERAL

## 1.1 SCOPE

The work includes furnishing, delivering, handling, installing (as applicable) all material, labor, equipment, tools and incidentals necessary to complete the work specified herein, including formwork related to the floodwalls, pedestrian bridge abutments, gate structure monoliths, pump station structure, and generator building foundation.

## 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN CONCRETE INSTITUTE (ACI)

ACI 347R (1994) Guide for Formwork for Concrete

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 31 (1994) Making and Curing Concrete Test Specimens in the Field

ASTM C 39 (1993a) Compressive Strength of Cylindrical Concrete Specimens

ASTM C 1074 (1993) Estimating Concrete Strength by the Maturity Method

ASTM C 1077 (1995a) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

## DEPARTMENT OF COMMERCE (DOC)

DOC PS 1 (1983) Construction and Industrial Plywood

## 1.3 DESIGN REQUIREMENTS

The design, engineering, and construction of the formwork shall be the responsibility of the Contractor. The formwork shall be designed for anticipated live and dead loads and shall comply with the tolerances specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. However, for

surfaces with an ACI Class A surface designation, the allowable deflection for facing material between studs, for studs between walers and walers between bracing shall be limited to 0.0025 times the span. The formwork shall be designed as a complete system with consideration given to the effects of cementitious materials and mixture additives such as fly ash, cement type, plasticizers, accelerators, retarders, air entrainment, and others. The adequacy of formwork design and construction shall be monitored prior to and during concrete placement as part of the Contractor's approved Quality Control Plan.

#### 1.4 SUBMITTALS

Government approval is required for all submittals with a "G" designation. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

##### SD-01 Data

##### Materials

Manufacturer's literature shall be submitted for plywood, concrete form hard board, form accessories, prefabricated forms, form coating, and form-lining materials.

##### Design Analysis

Design analysis and calculations for form design and methodology used in the design.

##### SD-04 Drawings

##### Shop Drawings

Drawings and design computations for all formwork required shall be submitted at least 30 days either before fabrication on site or before delivery of prefabricated forms.

##### SD-08 Statements

##### Shop Drawings; G RE.

If reshoring is permitted, the method, including location, order, and time of erection and removal shall also be submitted for review.

##### SD-09 Reports

##### Inspection.

The Contractor shall submit field inspection reports for concrete forms and embedded items.

##### Formwork Not Supporting Weight of Concrete; G AE.

If forms are to be removed in less than 24 hours on formwork not supporting

weight of concrete, the evaluation and results of the control cylinder tests or maturity instrumentation shall be submitted to and approved before the forms are removed.

## 1.5 SHOP DRAWINGS

The shop drawings and data submitted shall include the type, size, quantity, and strength of all materials of which the forms are made, the plan for jointing of facing panels, details affecting the appearance, and the assumed design values and loading conditions.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Forms and Form Liners

Forms and form liners shall be fabricated with facing materials that will produce a finish meeting the specified construction tolerance requirements and the following surface classifications as defined in ACI 347R.

##### 2.1.1.1 Class "B" Finish

This class of finish shall apply to all surfaces except those specified to receive Class C or Class D. The form facing material shall be composed of tongue-and-groove or shiplap lumber, plywood conforming to DOC PS 1, Grade B-B concrete form, tempered concrete form hard board or steel. Steel lining on wood sheathing will not be permitted.

##### 2.1.1.2 Class "C" Finish

This class of finish shall apply to all concrete exposed to public view. The form facing may be either tongue-and-groove lumber, plywood, concrete form hard board or steel. Wood form facing for curved or warped surfaces shall be composed of splines of lumber which can be bent to the required shape without splitting or cracking.

##### 2.1.1.3 Class "D" Finish

This class of finish shall apply to all other concrete not exposed to public view. The form facing may be of wood or steel.

#### 2.1.2 Form Coating

Form coating shall be commercial formulation that will not bond with, stain, cause deterioration, or any other damage to concrete surfaces. The coating shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds. If special form liners are to be used, the Contractor shall follow the recommendation of the form coating manufacturer.

### 2.2 ACCESSORIES

Ties and other similar form accessories to be partially or wholly embedded in the concrete shall be of a commercially manufactured type. After the ends or end fasteners have been removed, the embedded portion of metal ties shall terminate not less than 2 inches from any concrete surface either exposed to view or exposed to water. Plastic snap ties may be used in locations where the surface will not be exposed to view. Form ties shall be constructed so that the ends or end fasteners can be removed without spalling the concrete.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Form Construction

Forms shall be constructed true to the structural design and required alignment. The form surface and joints shall be mortar tight and supported to achieve safe performance during construction, concrete placement, and form removal. The Contractor shall continuously monitor the alignment and stability of the forms during all phases to assure the finished product will meet the required surface class or classes specified in paragraph FORMS AND FORM LINERS and tolerances specified in paragraph DESIGN REQUIREMENTS. Failure of any supporting surface either due to surface texture, deflection or form collapse shall be the responsibility of the Contractor as will the replacement or correction of unsatisfactory surfaces. When forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the completed surface to obtain accurate alignment of the surface and to prevent leakage of mortar. Forms shall not be re-used if there is any evidence of defects which would impair the quality of the resulting concrete surface. All surfaces of used forms shall be cleaned of mortar and any other foreign material before reuse.

#### 3.1.2 Chamfering

All exposed joints, edges and external corners shall be chamfered by molding placed in the forms unless the drawings specifically state that chamfering is to be omitted or as otherwise specified. Chamfered joints shall not be permitted where earth or rockfill is placed in contact with concrete surfaces. Chamfered joints shall be terminated twelve inches outside the limit of the earth or rockfill so that the end of the chamfers will be clearly visible.

#### 3.1.3 Coating

Forms for exposed or painted surfaces shall be coated with form oil or a form-release agent before the form or reinforcement is placed in final position. The coating shall be used as recommended in the manufacturer's instructions. Forms for unexposed surfaces may be wet with water in lieu of coating immediately before placing concrete, except that, in cold weather when freezing temperatures are anticipated, coating shall be mandatory. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

### 3.2 FORM REMOVAL

Forms shall not be removed without approval. The minimal time required for concrete to reach a strength adequate for removal of formwork without risking the safety of workers or the quality of the concrete depends on a number of factors including, but not limited to, ambient temperature, concrete lift heights, type and amount of concrete admixture, and type and amount of cementitious material in the concrete. It is the responsibility of the Contractor to consider all applicable factors and leave the forms in place until it is safe to remove them. In any case forms shall not be removed unless the minimum time or minimum compressive strength requirements below are met, except as otherwise directed or specifically authorized. When conditions are such as to justify the requirement, forms will be required to remain in place for a longer period. All removal shall be accomplished in a manner which will prevent damage to the concrete and ensure the complete safety of the structure. Where forms support more than one element, the forms shall not be removed until the form removal criteria are met by all supported elements. Form removal shall be scheduled so that all necessary repairs can be performed as specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Evidence that concrete has gained sufficient strength to permit removal of forms shall be determined by tests on control cylinders. All control cylinders shall be stored in the structure or as near the structure as possible so they receive the same curing conditions and protection methods as given those portions of the structure they represent. Control cylinders shall be removed from the molds at an age of no more than 24 hours. All control cylinders shall be prepared and tested in accordance with ASTM C 31 and ASTM C 39 at the expense of the Contractor by an independent laboratory that complies with ASTM C 1077 and shall be tested within 4 hours after removal from the site.

#### 3.2.1 Formwork Not Supporting Weight of Concrete

Formwork for walls, columns, sides of beams, gravity structures, and other vertical type formwork not supporting the weight of concrete shall not be removed in less than 24 hours after concrete placement is completed. Control cylinders shall be prepared for each set of forms to be removed before 24 hours. The stability of the concrete shall be evaluated by a structural engineer prior to removal of the forms.

#### 3.2.2 Formwork Supporting Weight of Concrete

Formwork supporting weight of concrete and shoring shall not be removed until structural members have acquired sufficient strength to safely support their own weight and any construction or other superimposed loads to which the supported concrete may be subjected. As a minimum, forms shall be left in place until control concrete test cylinders indicate evidence the concrete has attained at least 70 percent of the compressive strength required for the structure in accordance with the quality and location requirements of Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

### 3.3 INSPECTION

Forms and embedded items shall be inspected in sufficient time prior to each concrete placement by the Contractor in order to certify to the

Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

-- End of Section --

## SECTION 03151

EXPANSION, CONTRACTION AND CONSTRUCTION JOINTS IN CONCRETE FOR CIVIL WORKS  
**04/93**

Item No. 23 - Waterstop Type "Y"

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 920	(1995) Elastomeric Joint Sealants
ASTM D 1751	(1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1996) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 2628	(1991) Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
ASTM D 2835	(1989; R 1991) Lubricant for Installation fo Preformed Compression Seals in Concrete Pavements

## CORPS OF ENGINEERS (COE)

COE CRD-C 513	(1974) Corps of Engineers Specifications for Rubber Waterstops
COE CRD-C 572	(1974) Corps of Engineers Specifications for Polyvinylchloride Waterstop

## 1.2 SUBMITTALS

Government approval is required for all submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL



## PROCEDURES:

## SD-08 Statements

Splicing Waterstops; G.

Procedures for splicing waterstops shall be submitted.

## SD-09 Reports

Premolded Expansion Joint Filler Strips. Waterstops.

Certified manufacturer's test reports shall be provided for premolded expansion joint filler strips to verify compliance with applicable specification.

## SD-14 Samples

Field Molded Sealants and Primer.

One gallon of field-molded sealant and one quart of primer (when primer is recommended by the sealant manufacturer) shall be provided for testing.

Waterstops.

Waterstop materials and splice samples shall be submitted for inspection and testing and shall be identified to indicate manufacturer, type of material, size and quantity of material and shipment represented. Each materials sample shall be a piece not less than 12 inches long cut from each 200 feet of finished waterstop furnished, but not less than a total of four linear feet of each type and size furnished. For spliced segments of waterstops to be installed in the work, one spliced sample of each size and type for every 50 splices made in the factory and every 10 splices made at the job site shall be furnished for inspection and testing. The spliced samples shall be made using straight run pieces with the splice located at the mid-length of the sample and finished as required for the installed waterstop. The total length of each spliced sample shall be not less than 12 inches long.

## PART 2 PRODUCTS

## 2.1 MATERIALS

## 2.1.1 Premolded Expansion Joint Filler Strips

Premolded expansion joint filler strips shall conform to ASTM D 1751 or ASTM D 1752, Type I, or resin impregnated fiberboard conforming to the physical requirements of ASTM D 1752.

## 2.1.2 Joint Seals and Sealants

## 2.1.2.1 Field Molded Sealants and Primer

Field molded sealants and primer shall conform to ASTM C 920, Type M, Grade

NS, Class 25, use NT for vertical joints and Type M, Grade P, Class 25, use T for horizontal joints. Bond breaker material shall be polyethylene tape, coated paper, metal foil or similar type materials. The back-up material shall be compressible, nonshrink, nonreactive with sealant, and nonabsorptive material type such as extruded butyl or polychloroprene foam rubber.

#### 2.1.3 Waterstops

##### 2.1.3.1 Non-Metallic Waterstops

Rubber waterstops shall conform to COE CRD-C 513. Polyvinylchloride waterstops shall conform to COE CRD-C 572.

#### 2.2 TESTS, INSPECTIONS, AND VERIFICATIONS

##### 2.2.1 Materials Tests

###### 2.2.1.1 Field-Molded Sealants

Samples of sealant and primer, when use of primer is recommended by the manufacturer, as required in paragraph FIELD MOLDED SEALANTS AND PRIMER, shall be tested by and at the expense of the Government for compliance with paragraph FIELD MOLDED SEALANTS AND PRIMER. If the sample fails to meet specification requirements, new samples shall be provided and the cost of retesting will be paid by the Contractor.

###### 2.2.1.2 Non-Metallic Waterstops

Samples of materials and splices as required in paragraph WATERSTOPS shall be visually inspected and tested by and at the expense of the Government for compliance with COE CRD-C 513 or COE CRD-C 572 as applicable. If a sample fails to meet the specification requirements, new samples shall be provided and the cost of retesting will be paid by the Contractor.

##### 2.2.2 Splicing Waterstops

###### 2.2.2.1 Procedure and Performance Qualifications

Procedure and performance qualifications for splicing waterstops shall be demonstrated in the presence of the Contracting Officer.

###### 2.2.2.2 Non-Metallic Waterstops

Procedure and performance qualifications for splicing non-metallic waterstops shall be demonstrated by the manufacturer at the factory and the Contractor at the job site by each making three spliced samples of each size and type of finished waterstop.

#### PART 3 EXECUTION

##### 3.1 INSTALLATION

Joint locations and details, including materials and methods of

installation of joint fillers and waterstops, shall be as specified, as shown, and as directed. In no case shall any fixed metal be continuous through an expansion or contraction joint.

#### 3.1.1 Expansion Joints

Premolded filler strips shall have oiled wood strips secured to the top thereof and shall be accurately positioned and secured against displacement to clean, smooth concrete surfaces. The wood strips shall be slightly tapered, dressed and of the size required to install filler strips at the desired level below the finished concrete surface and to form the groove for the joint sealant or seals to the size shown. Material used to secure premolded fillers and wood strips to concrete shall not harm the concrete and shall be compatible with the joint sealant or seals. The wood strips shall not be removed until after the concrete curing period. The groove shall be thoroughly cleaned of all laitance, curing compound, foreign materials, protrusions of hardened concrete and any dust which shall be blown out of the groove with oil-free compressed air.

##### 3.1.1.1 Joints With Field-Molded Sealant

Joints shall not be sealed when the sealant, air or concrete temperature is less than 40 degrees F. Immediately prior to installation of field molded sealants, the joint shall be cleaned of all debris and further cleaned using water, chemical solvents or other means as recommended by the sealant manufacturer. The joints shall be dry prior to filling with sealant. Bond breaker and back-up material shall be installed where required. Joints shall be primed and filled flush with joint sealant in accordance with the manufacturer's recommendations.

#### 3.1.2 Contraction Joints

Joints requiring a bond breaker shall be coated with bituminous paint. Waterstops shall be protected during application of bond breaking material to prevent them from being coated.

#### 3.1.3 Waterstops

Waterstops shall be carefully and correctly positioned during installation to eliminate faulty installation that may result in joint leakage. All waterstops shall be installed so as to form a continuous watertight diaphragm in each joint. Adequate provision shall be made to support and protect the waterstops during the progress of work. Any waterstop punctured or damaged shall be replaced or repaired at the Contractor's expense. The concrete shall be thoroughly consolidated in the vicinity of the waterstop. Suitable guards shall be provided to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued.

##### 3.1.3.1 Splices

Joints in waterstops shall be spliced together by qualified splicers using the approved splicing procedures to form a continuous watertight diaphragm. Splices shall be as followed:

a. Non-Metallic Waterstops - All splices shall be made on a bench in a temporary shop provided at the site of the installation or at the manufacturer's plant. A miter guide and portable power saw shall be used to cut the ends to be joined to insure good alignment and contact between joined surfaces. Continuity of the characteristic features of the cross section of the waterstop (ribs, tabular center axis, protrusions and the like) shall be maintained across the splice.

b. Rubber Waterstops - Splices shall be vulcanized in accordance with the approved procedure.

c. Polyvinylchloride Waterstops - Splices shall be made by heat sealing the adjacent surfaces in accordance with the approved procedure. A thermostatically controlled electrical heat source shall be used to make all splices. The correct temperature at which splices should be made will differ with the material concerned but the applied heat should be sufficient to melt but not char the plastic. Waterstops shall be reformed at splices with a remolding iron with ribs or corrugations to match the pattern of the waterstop. The spliced area, when cooled and bent by hand in as sharp an angle as possible, shall show no sign of separation.

-- End of Section --

## SECTION 03210

STEEL BARS AND WELDED WIRE FABRIC FOR CONCRETE REINFORCEMENT  
**04/93**

## Item No. 10 - Steel Reinforcement

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN CONCRETE INSTITUTE (ACI)

ACI 315	(1980; R 1986) ACI Detailing Manual: Section Details and Detailing of Concrete Reinforcement
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## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185	(1990a) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 370	(1994) Mechanical Testing of Steel Products
ASTM A 497	(1990b) Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
ASTM A 615/A 615M	(1993) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 775/A 775M	(1993a) Epoxy-Coated Reinforcing Steel Bars

## AMERICAN WELDING SOCIETY (AWS)

AWS D1.4	(1994) Structural Welding Code - Reinforcing Steel
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## 1.2 SUBMITTALS

Government approval is required for all submittals with a "G" designation. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-04 Drawings

Fabrication and Placement; G AE.

The Contractor shall submit shop drawings which include: reinforcement steel placement drawings; reinforcement steel schedules showing quantity,

size, shape, dimensions, weight per foot, total weights and bending details; and details of bar supports showing types, sizes, spacing and sequence.

#### SD-09 Reports

Materials; G AE; Tests, Inspections, and Verifications; G AE.

Certified tests reports of reinforcement steel showing that the steel complies with the applicable specifications shall be furnished for each steel shipment and identified with specific lots prior to placement. Three copies of the heat analyses shall be provided for each lot of steel furnished and the Contractor shall certify that the steel conforms to the heat analyses.

#### SD-13 Certificates

##### Epoxy-Coated Bars

Written certification for coating material and coated bars shall be submitted with the delivery of the bars.

#### SD-14 Samples

##### Epoxy-Coated Bars.

Sample of coating material and 1.5 pounds of patching material shall be submitted with the delivery of the bars.

#### SD-18 Records

Materials; G AE.

A system of identification which shows the disposition of specific lots of approved materials in the work shall be established and submitted before completion of the contract.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Steel Bars

Steel bars shall comply with the requirements of ASTM A 615/A 615M ASTM A 616/A 616M including Supplementary Requirements, ASTM A 617/A 617M or ASTM A 706/A 607M, deformed, of the grades, sizes and lengths shown. If the Grade 40 bars shown are unavailable the Contractor may substitute Grade 50 or Grade 60 bars of the same size and spacing as indicated for Grade 40bars when authorized.

##### 2.1.1.1 NOT USED.

##### 2.1.1.2 Epoxy-Coated Bars

Epoxy-coated steel bars shall comply with the requirements of ASTM A 775/A 775M, including written certifications for coating material and coated bars, sample of coating material, and 0.5 pounds of patching material.

#### 2.1.1.3 Fabricated Bar Mats

Fabricated bar mats shall comply with the requirements of ASTM A 184/A 184M, clipped or welded mats, bar sizes and spacings as shown.

#### 2.1.2 Steel Welded Wire Fabric

Steel welded wire fabric shall comply with the requirements of ASTM A 185, ASTM A 497 wire sizes and spacings as shown. For wire with a specified yield strength (fy) exceeding 60,000 psi, fy shall be the stress corresponding to a strain of 0.35 percent.

#### 2.1.3 Accessories

##### 2.1.3.1 Bar Supports

Bar supports shall comply with the requirements of ACI 315. Supports for bars in concrete with formed surfaces exposed to view or to be painted shall be plastic-coated wire, stainless steel or precast concrete supports.

Precast concrete supports shall be wedged-shaped, not larger than 3-1/2 by 3-1/2 inches, of thickness equal to that indicated for concrete cover and have an embedded hooked tie-wire for anchorage. Bar supports used in precast concrete with formed surfaces exposed to view shall be the same quality, texture and color as the finish surfaces.

##### 2.1.3.2 Wire Ties

Wire ties shall be 16 gage or heavier black annealed wire. Ties for epoxy-coated bars shall be vinyl-coated or epoxy-coated. Ties for zinc-coated bars shall be zinc-coated.

#### 2.2 TESTS, INSPECTIONS, AND VERIFICATIONS

The Contractor shall have material tests required by applicable standards and specified herein performed by an approved laboratory and certified to demonstrate that the materials are in conformance with the specifications. Tests shall be performed and certified at the Contractor's expense.

##### 2.2.1 Reinforcement Steel Tests

Mechanical testing of steel shall be in accordance with ASTM A 370 except as otherwise specified or required by the material specifications. Tension tests shall be performed on full cross-section specimens using a gage length that spans the extremities of specimens with welds or sleeves included. Chemical analyses of steel heats shall show the percentages of carbon, phosphorous, manganese, sulphur and silicon present in the steel.

##### 2.2.2 Qualification of Steel Bar Butt-Splicers

Steel bar butt-splicers shall be certified to have satisfactorily completed

a course of instruction in the proposed method of butt-splicing or have satisfactorily performed such work within the preceding year.

#### 2.2.3 Qualification of Butt-Splicing Procedure

As a condition of approval of the butt-splicing procedure, the Contractor, in the presence of the Contracting Officer, shall make three test butt-splices of steel bars of each size to be spliced using the proposed butt-splicing method. These test butt-splices and unspliced bars of the same size shall be tension tested to destruction with stress-strain curves plotted for each test. Test results must show that the butt-splices meet the specified strength and deformation requirements in order for the splicing procedure to be approved.

#### 2.2.4 Radiographic Examination of Welds

Radiographic examination of welds shall be in accordance with ASTM E 94 and shall be performed and evaluated by an approved testing agency adequately equipped to perform such services. Radiographs of welds and evaluations of the radiographs submitted for approval shall become the property of the Government.

### PART 3 EXECUTION

#### 3.1 FABRICATION AND PLACEMENT

Reinforcement steel and accessories shall be fabricated and placed as specified and shown and approved shop drawings. Fabrication and placement details of steel and accessories not specified or shown shall be in accordance with ACI 315 and ACI 318/318R also ACI 318RM or as directed. Steel shall be fabricated to shapes and dimensions shown, placed where indicated within specified tolerances and adequately supported during concrete placement. At the time of concrete placement all steel shall be free from loose, flaky rust, scale (except tight mill scale), mud, oil, grease or any other coating that might reduce the bond with the concrete.

##### 3.1.1 Hooks and Bends

Steel bars, except for zinc-coated or epoxy-coated, shall be mill or field-bent. Zinc-Coated and epoxy-coated bars shall be mill-bent prior to coating. All steel shall be bent cold unless authorized. No steel bars shall be bent after being partially embedded in concrete unless indicated or authorized.

##### 3.1.2 Welding

Welding of steel bars will be permitted only where indicated or authorized. Welding shall be performed in accordance with AWS D1.4 except where otherwise specified or indicated.

##### 3.1.3 Placing Tolerances

###### 3.1.3.1 Spacing



The spacing between adjacent bars and the distance between layers of bars may not vary from the indicated position by more than one bar diameter nor more than 1 inch.

#### 3.1.3.2 Concrete Cover

The minimum concrete cover of main reinforcement steel bars shall be as shown. The allowable variation for minimum cover shall be as follows:

MINIMUM COVER	VARIATION
6 inch	plus 1/2 inch
4 inch	plus 3/8 inch
3 inch	plus 3/8 inch
2 inch	plus 1/4 inch
1-1/2 inch	plus 1/4 inch
1 inch	plus 1/8 inch
3/4 inch	plus 1/8 inch

#### 3.1.4 Splicing

Splices in steel bars shall be made only as required. Bars may be spliced at alternate or additional locations at no additional cost to the Government subject to approval.

##### 3.1.4.1 Lap Splices

Lap splices shall be used only for bars small than size 14 and welded wire fabric. Lapped bars may be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than 1/5 the required length of lap or 6 inches.

##### 3.1.4.2 Butt-Splices

Butt-splices shall be used only for splicing size 14 and 18 bars and for splicing #11 bars to larger bars except where otherwise shown or authorized. Butt-splices shall be made by a method which develops splices suitable for tension, compression and stress reversal applications. Welded butt-splices shall be full penetration butt welds. Butt-splices shall develop 90 percent of the specified minimum ultimate tensile strength of the smallest bar of each splice. Bars shall be cleaned of all oil, grease, dirt, rust, scale and other foreign substances and shall be flame dried before splicing. Adequate jigs and clamps or other devices shall be provided to support, align and hold the longitudinal centerline of the bars to be butt-spliced in a straight line. Butt-splices shall be as follows:

- a. Thermit Welded Butt Splices - Bars to be thermit welded shall be restricted to steel shown by heat analysis to have a sulfur content not exceeding 0.05 percent. The ends of bars to be thermit welded shall be cut square and smooth. Flame cutting will be permitted provided grinding is employed to remove the resulting scale and to square and smooth the cut ends to a condition equivalent to a saw cut. No

shearing will be permitted. Bars shall be cleaned and flame dried before splicing. The joint shall be properly aligned in the mold with a gap opening in accordance with the manufacturer's recommendations. Charging and firing shall conform to the manufacturer's recommendations. The end of bars and the welded mold shall be preheated before welding to a temperature of not less than 100 degrees F and the mold shall be left in place for at least 15 minutes after ignition. Risers shall be broken or burned off after removing the mold. Tension splices shall be staggered longitudinally a minimum of 5 feet so that no more than half of the bars are spliced at any one section or as otherwise indicated.

b. Mechanical Butt-Splices - Mechanical butt-splices shall be an approved exothermic, threaded coupling, swaged sleeve or other positive connecting type. Bars to be spliced by a mechanical butt-splicing process may be sawed, sheared or flame cut provided the ends of sheared bars are reshaped after shearing and all slag is removed from the ends of flame cut bars by chipping and wire brushing prior to splicing. Surfaces to be enclosed within a splice sleeve or coupling shall be cleaned by wire brushing or other approved method prior to splicing. Splices shall be made using manufacturer's standard jigs, clamps, ignition devices and other required accessories. In addition to the strength requirements specified herein paragraph BUTT-SPLICES the additional deformation of number 14 and smaller bars due to slippage or other movement within the splice sleeve shall not exceed 0.015 inches (unit strain 0.0015 inches/inch) beyond the elongation of an unspliced bar based upon a 10 inch gage length spanning the extremities of the sleeve at a stress of 30,000 psi. The additional deformation of number 18 bars shall not exceed 0.03 inches (unit strain 0.003 inches/inch) beyond the elongation of an unspliced bar based upon a 10 inch gage length spanning the extremities of the sleeve at a stress of 30,000 psi. The amount of the additional deformation shall be determined from the stress-strain curves of the unspliced and spliced bars tested as required herein paragraph QUALIFICATION OF BUTT-SPLICING PROCEDURE for qualification of the butt-splicing procedure. Tension splices of number 14 or smaller bar shall be staggered longitudinally a minimum of 5 feet or as otherwise indicated so that no more than half of the bars are spliced at any one section. Tension splices of number 18 bars shall be staggered longitudinally a minimum of 5 feet so that no more than 1/3 of the bars are spliced at any one section.

### 3.2 FIELD TESTS AND INSPECTIONS

#### 3.2.1 Butt-Splices

##### 3.2.1.1 Identification of Splices

The Contractor shall establish and maintain an approved method of identification of all field splices which will indicate the splicer and the number assigned each splice made by the splicer.

##### 3.2.1.2 Examining, Testing, and Correcting

The Contractor shall perform the following during the butt-splicing

operations as specified herein and as directed:

a. Visual Examination - All welded splices shall be visually examined for the presence of cracks, undercuts, inadequate size and other visible defects. Respliced connections resulting from correction of visual defects may be radiographically examined at the option of the Contracting Officer as specified herein paragraph SUPPLEMENTAL EXAMINATION. Exothermic mechanical butt-splices shall be visually examined to determine if the filler metal is clearly visible at the tap holes and completely fills the sleeves at both ends except for spaces of not more than 3/8 inch occupied by packing.

b. Tension Tests - Tensions tests to 90 percent of the minimum specified ultimate tensile strength of the spliced bars or to destruction shall be performed on one test specimen made in the field for every 25 splices made. Test specimens shall be made by the splicers engaged in the work, using the approved splicing procedure and the same size bars placed in the same relative position, and under the same conditions as those in the groups represented by the specimens. Stress-strain curves shall be furnished for each butt-splice tested.

c. Radiographic Examination - Not less than one of each 25 welded splices selected at random by the Contracting Officer shall be examined radiographically and evaluated for defects. The greatest dimension of any porosity (gas pocket or similar void) or fusion-type defect (slag inclusion, incomplete fusion or similar generally elongated defect in weld fusion) shall not exceed 1/4 inch. The minimum clearance between edges of porosity or fusion-type defects shall not be less than 1 inch.

d. Correction of Deficiencies - No splice shall be embedded in concrete until satisfactory results of visual examination and the required tests or examinations have been obtained. All splices having visible defects or represented by test specimens which do not satisfy the tests or examinations shall be removed. If any of the tension test specimens fail to meet the strength requirements or deformation limitations two production splices from the same lot represented by the test specimens which failed shall be cut out and tension tested by the Contractor. If both of the retests pass the strength requirements and deformation limitations all of the splices in the lot will be accepted.

If one or both of the retests fail to meet the strength requirements or deformation limitations all of the splices in the lot will be rejected. All costs of removal, testing and resplicing of the additional production splices shall be borne by the Contractor. The bars of rejected splices shall be cut off outside the splice zone of weld metal, filler metal contact, coupling or sleeve. The cut ends shall be finished as specified and the joints shall be respliced and reinspected at no additional cost.

e. Supplemental Examination - The Contracting Officer may require additional or supplemental radiographic examination and/or tension test of any completed splice. For costs of such examinations and tests see paragraph UNIT PRICES.

-- End of Section --



## SECTION 03301

CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS  
**03/94**

Item No. 9 - Concrete

Item No. 42 - Anti-Graffiti Paint

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## ACI INTERNATIONAL (ACI)

ACI 117/117R	(1990; Errata) Standard Tolerances for Concrete Construction and Materials
ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 214	(1977; R 1989) Evaluation of Strength Test Results of Concrete
ACI 305R	(1991) Hot Weather Concreting
ACI 318/318R	(1992; Rev 1992; Errata) Building Code Requirements for Reinforced Concrete

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 31	(1991) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1993) Concrete Aggregates
ASTM C 39	(1994) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 40	(1992) Organic Impurities in Fine Aggregates for Concrete
ASTM C 42	(1994) Obtaining and Testing Drilled Cores and Sawed Beam of Concrete
ASTM C 87	(1983; R 1990) Effect of Organic Impurities in Fine Aggregate on Strength of Mortar

ASTM C 94	(1994) Ready-Mixed Concrete
ASTM C 117	(1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 127	(1988; R 1993) Specific Gravity and Absorption of Coarse Aggregate
ASTM C 128	(1993) Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	(1989) Resistance to Degradation of Small-Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1995a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 142	(1978; R 1990) Clay Lumps and Friable Particles in Aggregates
ASTM C 143	(1990a) Slump of Hydraulic Cement Concrete
ASTM C 150	(1995) Portland Cement
ASTM C 171	(1992) Sheet Materials for Curing Concrete
ASTM C 172	(1990) Sampling Freshly Mixed Concrete
ASTM C 192	(1990a) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1991b) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(1994) Air-Entraining Admixtures for Concrete
ASTM C 295	(1990) Petrographic Examination of Aggregates for Concrete
ASTM C 309	(1994) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 441	(1989) Effectiveness of Mineral Admixtures or Ground Blast-Furnace Slag in Preventing Excessive Expansion of Concrete Due to the Alkali-Silica Reaction
ASTM C 494	(1992) Chemical Admixtures for Concrete
ASTM C 535	(1989) Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion

	and Impact in the Los Angeles Machine
ASTM C 566	(1989) Total Moisture Content of Aggregate by Drying
ASTM C 595	(1994a) Blended Hydraulic Cement
ASTM C 597	(1983; R 1991) Pulse Velocity Through Concrete
ASTM C 666	(1992) Resistance of Concrete to Rapid Freezing and Thawing
ASTM C 803	(1990) Penetration Resistance of Hardened Concrete
ASTM C 805	(1994) Rebound Number of Hardened Concrete
ASTM C 881	(1990) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 1017	(1992) Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1059	(1991) Latex Agents for Bonding Fresh to Hardened Concrete
ASTM C 1064	(1986; R 1993) Temperature of Freshly Mixed Portland Cement Concrete
ASTM C 1077	(1995a) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM D 75	(1987; R 1992) Sampling Aggregates

## CORPS OF ENGINEERS (COE)

COE CRD-C 94	(1995) Specifications for Surface Retarders
COE CRD-C 100	(1975) Method of Sampling Concrete Aggregate and Aggregate Sources, and Selection of Material for Testing
COE CRD-C 104	(1980) Method of Calculation of the Fineness Modulus of Aggregate
COE CRD-C 114	(1994) Test Method for Soundness of Aggregates by Freezing and Thawing of Concrete Specimens
COE CRD-C 130	(1989) Estimating Scratch Hardness of Coarse Aggregate Particles

COE CRD-C 143	(1962) Specifications for Meters for Automatic Indication of Moisture in Fine Aggregate
COE CRD-C 318	(1972) Cloth, Burlap, Jute (or Kenaf)
COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete
COE CRD-C 521	(1981) Standard Test Method for Frequency and Amplitude of Vibrators for Concrete

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44	(1994) NIST Handbook 44: Specifications, Tolerances, and other Technical Requirements for Weighing and Measuring Devices
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NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100	(1990) Concrete Plant Standards
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MASTER PAINTERS INSTITUTE (MPI)

MPI 31	(2001) Polyurethane, Moisture Cured, Clear Gloss
MPI 72	(2001) Polyurethane, Two Component, Pigmented, Gloss

## 1.2 SUBMITTALS

Government approval is required for all submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

### SD-01 Data

#### Concrete Mixture Proportioning

Concrete mixture proportions shall be determined by the Contractor, in accordance with the requirements in paragraph CONCRETE MIXTURE PROPORTIONING, and submitted for review. The concrete mixture quantities of all ingredients per cubic yard and nominal maximum coarse aggregate size that will be used in the manufacture of each quality of concrete shall be stated. Proportions shall indicate the mass of cement, pozzolan and ground granulated blast-furnace (GGBF) slag when used, and water; the mass of aggregates in a saturated surface-dry condition; and the quantities of



admixtures. The submission shall be accompanied by test reports from a laboratory complying with ASTM C 1077 which show that proportions thus selected will produce concrete of the qualities indicated. No substitution shall be made in the source or type of materials used in the work without additional tests to show that the quality of the new materials and concrete are satisfactory.

#### Batch Plant.

The Contractor shall submit batch plant data to the Contracting Officer for review for conformance with applicable specifications.

#### Concrete Mixers.

The Contractor shall submit concrete mixer data which includes the make, type, and capacity of concrete mixers proposed for mixing concrete in conformance with the paragraphs CAPACITY and CONCRETE MIXERS.

#### Conveying Equipment and Methods.

The conveying equipment and methods for transporting, handling, and depositing the concrete shall be submitted for review by the Contracting Officer for conformance with paragraphs CAPACITY and CONVEYING EQUIPMENT.

#### Placing Equipment and Methods.

All placing equipment and methods shall be submitted for review by the Contracting Officer for conformance with paragraph CAPACITY.

### SD-08 Statements

#### Testing Technicians. Concrete Construction Inspector.

The Contractor shall submit statements that the concrete testing technicians and the concrete inspectors meet the requirements of paragraph TESTS AND INSPECTIONS.

#### Construction Joint Treatment; G.

The method and equipment proposed for joint cleanup and waste disposal shall be submitted for review and approval for conformance with paragraph CONSTRUCTION JOINT TREATMENT.

#### Curing and Protection; G.

The curing medium and methods to be used shall be submitted for review and approval for conformance with paragraph CURING AND PROTECTION.

#### Cold-Weather Placing; G.

If concrete is to be placed under cold-weather conditions, the proposed materials, methods, and protection meeting the requirements of paragraph COLD-WEATHER PLACING shall be submitted for approval.

Hot-Weather Placing; G.

If concrete is to be placed under hot-weather conditions, the proposed materials and methods, meeting the requirements of paragraph HOT-WEATHER PLACING and paragraph FINISHING, shall be submitted for review and approval.

#### SD-09 Reports

Aggregate Quality; G.

Aggregate quality tests shall be submitted at least 30 days prior to start of concrete placement, in accordance with paragraph QUALITY OF AGGREGATES.

Uniformity of Concrete Mixing.

The results of the initial mixer uniformity tests as required in paragraph MIXER UNIFORMITY shall be submitted at least 5 days prior to the initiation of placing.

Tests and Inspections.

Test results and inspection reports shall be submitted daily and weekly as required in paragraph REPORTS.

#### SD-13 Certificates

Cementitious Materials.

Cementitious Materials, including Cement, will be accepted on the basis of the manufacturer's certification of compliance, accompanied by mill test reports that materials meet the requirements of the specification under which they are furnished. Certification and mill test reports shall be from samples taken from the particular lot furnished. No cementitious materials shall be used until notice of acceptance has been given by the Contracting Officer. Cementitious materials will be subject to check testing from samples obtained at the source, at transfer points, or at the project site, as scheduled by the Contracting Officer, and such sampling will be by or under the supervision of the Government at its expense. Material not meeting specifications shall be promptly removed from the site of work.

Impervious-Sheet Curing Materials.

Impervious-Sheet Curing Materials shall be certified for compliance with all specification requirements.

Air-Entraining Admixture.

Air-Entraining Admixture shall be certified for compliance with all specification requirements.

Other Chemical Admixtures.

Other Chemical Admixtures shall be certified for compliance with all

specification requirements.

Membrane-Forming Curing Compound.

Membrane-Forming Curing Compound shall be certified for compliance with all specification requirements.

Epoxy Resin. Latex Bonding Compound.

Epoxy Resin and Latex Bonding Compound shall be certified for compliance with all specification requirements.

Nonshrink Grout.

Descriptive literature of the Nonshrink Grout proposed for use shall be furnished together with a certificate from the manufacturer stating that it is suitable for the application or exposure for which it is being considered.

#### SD-14 Samples

Aggregates; G. Cementitious Materials, Admixtures, and Curing Compound; G.

### 1.3 TESTING AND SAMPLING

#### 1.3.1 Preconstruction Sampling and Testing

##### 1.3.1.1 Cementitious Materials, Admixtures, and Curing Compound

At least 60 days in advance of concrete placement, the Contractor shall notify the Contracting Officer of the sources for cementitious materials, admixtures, and curing compound, along with sampling location, brand name, type, and quantity to be used in the manufacture and/or curing of the concrete.

#### 1.3.2 Chemical Admixtures Storage

Chemical admixtures that have been in storage at the project site for longer than 6 months or that have been subjected to freezing shall be retested at the expense of the Contractor when directed by the Contracting Officer and shall be rejected if test results are not satisfactory. Chemical admixtures will be accepted based on compliance with the requirements of paragraph CHEMICAL ADMIXTURES.

##### 1.3.2.1 Cement

If cement or pozzolan is to be obtained from more than one source, the initial notification shall state the estimated amount to be obtained from each source and the proposed schedule of shipments.

### 1.4 DESIGN REQUIREMENTS

#### 1.4.1 Concrete Strength

Specified compressive strength  $f'_c$  shall be as follows:

COMPRESSIVE STRENGTH (PSI)	STRUCTURE OR PORTION OF STRUCTURE
4,000 @ 28 days	All structures

#### 1.4.2 Maximum Water-Cement (W/C) Ratio

Maximum W/C shall be as follows:

WATER-CEMENT RATIO, BY MASS	STRUCTURE OR PORTION OF STRUCTURE
0.45	All structures

These W/C's may cause higher strengths than that required by paragraph CONCRETE STRENGTH.

### 1.5 CONSTRUCTION TOLERANCES

#### 1.5.1 General

The definitions of the terms used in the following tables shall be as defined in ACI 117/117R. Level and grade tolerance measurements of slabs shall be made as soon as possible after finishing. When forms or shoring are used, the measurements shall be made prior to removal. Tolerances are not cumulative. The most restrictive tolerance controls. Tolerances shall not extend the structure beyond legal boundaries. Except as specified otherwise, plus tolerance increases the amount or dimension to which it applies, or raises a level alignment, and minus tolerance decreases the amount or dimension to which it applied, or lowers a level alignment. A tolerance without sign means plus or minus. Where only one signed tolerance is specified, there is no limit in the other direction.

#### TOLERANCES FOR FOUNDATIONS

##### (1) Lateral alignment

Eccentricity measured from the  
center of gravity of footing  
as cast to the center of gravity  
as specified; 0.02 times width  
of footing in direction of  
misplacement but not more than ..... 2 in.

Supporting masonry construction ..... 1/2 in.

##### (2) Level alignment

Top of footings supporting masonry ..... 1/2 in.

Top of other footings ..... +1/2 in.

## TOLERANCES FOR FOUNDATIONS

- ..... -2 in.
- (3) Cross-sectional dimensions
- Horizontal dimension of formed members ..... +2 in.  
 ..... -1/2 in.
- Horizontal dimensions of unformed  
 members cast against soil
- 2 ft or less ..... +3 in.  
 ..... -1/2 in.
- Greater than 2 ft but less than 6 ft ..... +6 in.  
 ..... -1/2 in.
- Over 6 ft ..... +12 in.  
 ..... -1/2 in.
- Vertical dimension (thickness) ..... -5 percent
- (4) Relative alignment
- Slope of footing side and top  
 surfaces with respect to  
 the specified plane ..... 1 in. per 10 ft

## TOLERANCE FOR FINISHED FORMED CONCRETE SURFACES

- (1) Vertical alignment
- Formed surfaces slope with  
 respect to the specified plane
- Vertical alignment of outside  
 corner of exposed corner  
 columns and control joint  
 grooves in concrete exposed  
 to view ..... 1/4 in. in 10 ft
- All other conditions ..... 3/8 in. in 10 ft
- (2) Abrupt variation
- The offset between concrete  
 surfaces for the following  
 classes of surface:  
 (For Class AHV, positive means  
 raise of elevation in the  
 direction of waterflow,  
 negative means drop of elevation  
 in the direction of waterflow)

## TOLERANCE FOR FINISHED FORMED CONCRETE SURFACES

*Class AHV, in the direction of waterflow .....	+0 in.
.....	-1/8 in.
perpendicular to the direction of waterflow .....	1/8 in.
Class A .....	1/8 in.
Class B .....	1/4 in.
Class C .....	1/4 in.
Class D .....	1 in.

\*Includes any high-velocity ( $\geq 40$  fps) waterflow on any surface.

## (3) Gradual variation

Surface finish tolerances  
as measured by placing a  
freestanding (unleveled), 5-ft  
straightedge for plane surface  
or curved template for curved  
surface anywhere on the  
surface and allowing it to rest  
upon two high spots within  
72 hr after concrete placement.  
The gap at any point  
between the straightedge or  
template and the surface shall  
not exceed:

*Class A (including Class AHV) .....	1/8 in.
Class B .....	1/4 in.
Class C .....	1/2 in.
Class D .....	1 in.

\*Includes any high-velocity ( $\geq 40$  fps) waterflow on  
any surface.

TOLERANCES FOR CAST-IN-PLACE, VERTICALLY SLIPFORMED  
BUILDING ELEMENTS(1) Translation and rotation from  
a fixed point at the base of  
the structure:

For heights 100 ft or less ..... 2 in.

For heights greater than 100 ft,  
1/600 times the height  
but not more than ..... 8 in.

## (2) Lateral alignment

Between adjacent elements ..... 2 in.

TOLERANCES FOR CAST-IN-PLACE, VERTICALLY SLIPFORMED  
BUILDING ELEMENTS

(3) Cross-sectional dimensions

Wall thickness ..... +3/4 in.  
..... -3/8 in.

(4) Relative alignment

Formed surface slope with  
respect to the specified plane ..... 3/4 in. in 10 ft

TOLERANCES FOR BRIDGES, EROSION-PROTECTION STRUCTURES,  
AND SMALL HYDRAULIC STRUCTURES

(1) Vertical alignment

Exposed surfaces ..... 3/4 in.  
Concealed surfaces ..... 1-1/2 in.

(2) Lateral alignment

Centerline alignment ..... 1 in.

(3) Level alignment (The following  
tolerances are for bridges  
only. For all other floor or  
slab tolerances see the  
paragraphs on floor tolerances  
following these tables.)

Profile grade ..... 1 in.

Top of other concrete surfaces  
and horizontal grooves.

Exposed ..... 3/4 in.  
Concealed ..... 1-1/2 in.

Mainline pavements in  
longitudinal direction,  
the gap below a 10-ft unlevelled  
straightedge resting on  
high spots shall not exceed ..... 1/8 in.

Mainline pavements and slabs  
in transverse direction,  
the gap below a 10-ft unlevelled  
straightedge resting on  
high spots shall not exceed ..... 1/4 in.

TOLERANCES FOR BRIDGES, EROSION-PROTECTION STRUCTURES,  
AND SMALL HYDRAULIC STRUCTURES

Ramps, sidewalks, and intersections,  
in any direction, the  
gap below a 10-ft unlevelled  
straightedge resting on  
high spots shall not exceed ..... 1/4 in.

(4) Cross-sectional dimensions

Bridge slab thickness ..... +1/4 in.  
..... -1/8 in.

Members such as columns, beams,  
piers, walls, and others  
(slabs--thickness only) ..... +1/2 in.  
..... -1/4 in.

Openings through concrete members ..... 1/2 in.

(5) Relative alignment

Location of openings  
through concrete members ..... 1/2 in.

Formed surface slope with  
respect to the specified plane

Watertight joints ..... 1/8 in. in 10 ft  
Other exposed surfaces ..... 1/2 in. in 10 ft  
Concealed surfaces ..... 1 in. in 10 ft

Unformed exposed surfaces  
slopes with respect to the  
specified plane ..... 1/4 in. in 10 ft  
..... 3/8 in. in 20 ft

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Cementitious Materials

Cementitious materials shall be portland cement and shall conform to appropriate specifications listed below. Use of cementitious materials in architectural concrete shall be restricted to one color, one source, and one type.

2.1.1.1 Portland Cement

ASTM C 150, Type I or II, except that the maximum amount of C3A in Type I cement shall be 15 percent including the heat of hydration at 7 days, including false set requirements, low alkali when used with aggregates



listed at the end of this section which require it. White portland cement shall meet the above requirements except that it may be Type I, Type II, or Type III low alkali.

#### 2.1.1.2 High-Early-Strength Portland Cement

ASTM C 150, Type III, with C3A limited to 5 percent.

#### 2.1.2 Aggregates

##### 2.1.2.1 General

Concrete aggregates may be furnished from any source capable of meeting the quality requirements as stated in paragraph QUALITY. The test results and conclusions shall be considered valid only for the sample tested and shall not be taken as an indication of the quality of all material from a source nor for the amount of processing required. Fine and coarse aggregates shall conform to the grading requirements of ASTM C 33. The nominal maximum size shall be as listed in paragraph NOMINAL MAXIMUM-SIZE COARSE AGGREGATE. Where the use of highway department gradations are permitted, proposed gradations shall be submitted for approval.

##### 2.1.2.2 Concrete Aggregate Sources

a. Selection of Source - After the award of the contract, the Contractor shall designate in writing only one source or combination of sources from which he proposes to furnish aggregates. Regardless of the source, selected samples for acceptance testing shall be provided. If a source for coarse or fine aggregates so designated by the Contractor does not meet the quality requirements stated in paragraph QUALITY, the Contractor may not submit for approval.

##### 2.1.2.3 Quality

Aggregates delivered to the mixer shall meet the following requirements:

PROPERTY TEST	FINE AGGREGATE	TEST LIMITS	
		COARSE AGGREGATE	
Specific Gravity	2.6	2.64	ASTM C 127 ASTM C 128
Absorption	2.0	2.0	ASTM C 127 ASTM C 128
Durability Factor using (Procedure A)	10%	10%	COE CRD-C 114 ASTM C 666
Clay Lumps and Friable Particles	3%	3%	ASTM C 142
Material Finer than 75- $\mu$ m			

PROPERTY TEST	FINE AGGREGATE	TEST LIMITS	
		COARSE AGGREGATE	
(No. 200) Sieve	5%	1%	ASTM C 117
Organic Impurities	Not darker than No. 3		ASTM C 40
	Not less than 95 percent		ASTM C 87
Test Limits			
L.A. Abrasion	--	19	ASTM C 131 ASTM C 535
Soft Particles	3%	3%	COE CRD-C 130
Chert, less than 2.40 specific gravity	3%	3%	ASTM C 123
Coal and Lignite, less than less than 2.00 specific gravity	3%	3%	ASTM C 123
Petrographic Examination	Fresh interlocking crystalline with few voids no clay minerals adn no soluble minerals		ASTM C 295

### 2.1.3 Chemical Admixtures

Chemical admixtures to be used, when required or permitted, shall conform to the appropriate specification listed.

#### 2.1.3.1 Air-Entraining Admixture

The air-entraining admixture shall conform to ASTM C 260 and shall consistently cause the concrete to have an air content in the specified ranges under field conditions.

#### 2.1.3.2 Accelerating Admixture

Accelerators shall meet the requirements of ASTM C 494, Type C or E, except that calcium chloride or admixtures containing calcium chloride shall not be used.

#### 2.1.3.3 Water-Reducing or Retarding Admixture

a. Water-Reducing or Retarding Admixtures: ASTM C 494, Type A, B, or D, except that the 6-month and 1-year compressive strength tests are waived.

b. High-Range Water Reducing Admixture: ASTM C 494, Type F or G except that the 6-month and 1-year strength requirements shall be waived. The admixture may be used only when approved by the Contracting Officer, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan.

#### 2.1.3.4 Other Chemical Admixtures

Other chemical admixtures for use in producing flowing concrete shall comply with ASTM C 1017, Type 1 or 2. These admixture shall be used only for concrete listed in paragraph SLUMP.

#### 2.1.4 Curing Materials

##### 2.1.4.1 Impervious-Sheet Curing Materials

Impervious-sheet curing materials shall conform to ASTM C 171, type optional, except polyethylene film shall not be used.

##### 2.1.4.2 Membrane-Forming Curing Compound

The membrane-forming curing compound shall conform to ASTM C 309, Type 1-D or 2, except a styrene acrylate or chlorinated rubber compound meeting Class B requirements shall be used for surfaces that are to be painted or are to receive bituminous roofing, or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, coating, or flooring specified. Nonpigmented compound shall contain a fugitive dye and shall have the reflective requirements in ASTM C 309 waived.

##### 2.1.4.3 Burlap

Burlap used for curing shall conform to COE CRD-C 318.

#### 2.1.5 Water

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that nonpotable water may be used if it meets the requirements of COE CRD-C 400.

#### 2.1.6 Abrasive Aggregates

Fifty-five percent, minimum, aluminum oxide or silicon-dioxide abrasive ceramically bonded together to form a homogeneous material sufficiently porous to provide a good bond with portland paste; or factory-graded emery aggregate consisting of not less than 45 percent aluminum oxide and 25 percent ferric oxide. The aggregate shall be well graded from particles retained on the 600- $\mu$ m (No. 30) sieve to particles passing the 2.36-mm (No. 8) sieve.

#### 2.1.7 Latex Bonding Compound

Latex bonding compound agents for bonding fresh to hardened concrete shall conform to ASTM C 1059.

#### 2.1.8 Epoxy Resin

Epoxy resin for use in repairs shall conform to ASTM C 881, Type III, Grade I or II.

## 2.2 CONCRETE MIXTURE PROPORTIONING

### 2.2.1 Quality of Mixture

For each portion of the structure, mixture proportions shall be selected so that the strength and W/C requirements listed in paragraph DESIGN REQUIREMENTS are met.

### 2.2.2 Nominal Maximum-Size Coarse Aggregate

Nominal maximum-size coarse aggregate shall be 1 inch except 19.0 mm (3/4 inch) nominal maximum-size coarse aggregate shall be used when any of the following conditions exist: the narrowest dimension between sides of forms is less than 7-1/2 inches, the depth of the slab is less than 4 inches, or the minimum clear spacing between reinforcing is less than 2-1/4 inches.

### 2.2.3 Air Content

Air content as delivered to the forms and as determined by ASTM C 231 shall be between 4 and 7 percent except that when the nominal maximum-size coarse aggregate is 3/4 inch, it shall be between 4-1/2 and 7-1/2 percent.

### 2.2.4 Slump

The slump shall be determined in accordance with ASTM C 143 and shall be within the range of 1 to 4 inch. Where placement by pump is approved, the slump shall not exceed 6 inches.

### 2.2.5 Concrete Proportioning

Trial batches and testing requirements for various qualities of concrete specified shall be the responsibility of the Contractor. Samples of aggregates shall be obtained in accordance with the requirements of ASTM D 75. Samples of materials other than aggregate shall be representative of those proposed for the project and shall be accompanied by the manufacturer's test reports indicating compliance with applicable specified requirements. Trial mixtures having proportions, consistencies, and air content suitable for the work shall be made based on methodology described in ACI 211.1, using at least three different water-cement ratios, which will produce a range of strength encompassing those required for the work. The maximum water-cement ratios required in paragraph MAXIMUM WATER-CEMENT RATIO will be converted to a weight ratio of water to cement plus pozzolan by mass, silica fume, or GGBF slag by mass equivalency as described in ACI 211.1. In the case where GGBF slag is used, the weight of the slag shall be included in the equations for the term P, which is used to denote the mass of pozzolan. If pozzolan is used in the concrete mixture, the minimum pozzolan content shall be 15 percent of the total cementitious material. Trial mixtures shall be proportioned for maximum permitted slump and air content with due consideration to the approved conveying and placement method. The temperature of concrete in each trial batch shall be reported.

For each water-cement ratio, at least three test cylinders for each test age shall be made and cured in accordance with ASTM C 192. They shall be tested at 7 days and at the design age specified in paragraph DESIGN

REQUIREMENTS in accordance with ASTM C 39. From these test results, a curve will be plotted showing the relationship between water-cement ratio and strength.

#### 2.2.6 Required Average Compressive Strength

In meeting the strength requirements specified in paragraph CONCRETE STRENGTH, the selected mixture proportion shall produce a required average compressive strength  $f'_{cr}$  exceeding the specified strength  $f'_c$  by the amount indicated below.

##### 2.2.6.1 Average Compressive Strength from Test Records

Where a concrete production facility has test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214.

Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected, shall represent concrete produced to meet a specified strength or strengths ( $f'_c$ ) within 1,000 psi of that specified for proposed work, and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days or at another test age designated for determination of  $f'_c$ .

Required average compressive strength  $f'_{cr}$  used as the basis for selection of concrete proportions shall be the larger of the equations that follow using the standard deviation as determined above:

$$f'_{cr} = f'_c + 1.34S$$

$$f'_{cr} = f'_c + 2.33S - 500$$

Where S = standard deviation

Where a concrete production facility does not have test records meeting the requirements above but does have a record based on 15 to 29 consecutive tests, a standard deviation shall be established as the product of the calculated standard deviation and a modification factor from the following table:

NUMBER OF TESTS*	MODIFICATION FACTOR FOR STANDARD DEVIATION	
	Use tabulation in paragraph DETERMINING REQUIRED AVERAGE STRENGTH	
less than 15		
15		1.16
20		1.08
25		1.03
30 or more		1.00

\*Interpolate for intermediate numbers of tests.

##### 2.2.6.2 Average Compressive Strength without Previous Test Records

When a concrete production facility does not have sufficient field strength

test records for calculation of the standard deviation, the required average strength  $f'_{cr}$  shall be determined as follows:

If the specified compressive strength  $f'_c$  is less than 3,000 psi,

$$f'_{cr} = f'_c + 1,000$$

If the specified compressive strength  $f'_c$  is 3,000 to 5,000 psi,

$$f'_{cr} = f'_c + 1,200$$

If the specified compressive strength  $f'_c$  is over 5,000 psi,

$$f'_{cr} = f'_c + 1,400$$

### PART 3 EXECUTION

#### 3.1 EQUIPMENT

##### 3.1.1 Capacity

The batching, mixing, conveying, and placing equipment shall have a capacity of at least 100 cubic yards per hour.

##### 3.1.2 Batch Plant

Batch plant shall conform to the requirements of NRMCA CPMB 100 and as specified; however, rating plates attached to batch plant equipment are not required.

##### 3.1.2.1 Batching Equipment

The batching controls shall be semiautomatic or automatic. The semiautomatic batching system shall be provided with interlocks such that the discharge device cannot be actuated until the indicated material is within the applicable tolerance. The batching system shall be equipped with an accurate recorder or recorders that meet the requirements of NRMCA CPMB 100. Separate bins or compartments shall be provided for each size group of aggregate and cement, pozzolan, and GGBF slag. Aggregates shall be weighed either in separate weigh batchers with individual scales or cumulatively in one weigh batcher on one scale. Aggregate shall not be weighed in the same batcher with cement, pozzolan, or GGBF slag. If both cement and pozzolan or GGBF slag are used, they may be batched cumulatively provided that the portland cement is batched first. If measured by mass, the mass of the water shall not be weighed cumulatively with another ingredient. Water batcher filling and discharging valves shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed. An accurate mechanical device for measuring and dispensing each admixture shall be provided. Each dispenser shall be interlocked with the batching and discharging operation of the water so that each admixture is separately batched and discharged automatically in a manner to obtain uniform distribution throughout the batch in the specified mixing period. Admixtures shall not be combined prior to introduction in water. The plant shall be arranged so as to facilitate the inspection of

all operations at all times. Suitable facilities shall be provided for obtaining representative samples of aggregates from each bin or compartment. All filling ports for cementitious materials bins or silos shall be clearly marked with a permanent sign stating the contents.

#### 3.1.2.2 Scales

The equipment for batching by mass shall conform to the applicable requirements of NIST HB 44, except that the accuracy shall be plus or minus 0.2 percent of scale capacity. The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring devices. Tests shall be made at the frequency required in paragraph TESTS AND INSPECTIONS, and in the presence of a government inspector.

#### 3.1.2.3 Batching Tolerances

##### a. Weighing Tolerances

MATERIAL	PERCENT OF REQUIRED MASS
Cementitious materials	0 to plus 2
Aggregate	plus or minus 2
Water	plus or minus 1
Chemical admixture	0 to plus 6

b. Volumetric Tolerances - For volumetric batching equipment, the following tolerances shall apply to the required volume of material being batched:

Water: ..... Plus or minus 1 percent.  
Chemical admixtures: ..... Zero to plus 6 percent.

#### 3.1.2.4 Moisture Control

The plant shall be capable of ready adjustment to compensate for the varying moisture content of the aggregates and to change the masses of the materials being batched. An electric moisture meter complying with the provisions of COE CRD-C 143 shall be provided for measuring moisture in the fine aggregate. The sensing element shall be arranged so that the measurement is made near the batcher charging gate of the sand bin or in the sand batcher.

#### 3.1.3 Concrete Mixers

The concrete mixers shall not be charged in excess of the capacity recommended by the manufacturer. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer. The mixers shall be maintained in satisfactory operating condition, and the mixer drums shall be kept free of hardened concrete. Should any mixer at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired.

#### 3.1.3.1 Stationary Mixers

Concrete plant mixers shall be tilting, nontilting, horizontal-shaft, vertical-shaft, or pugmill and shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed.

The mixing time and uniformity shall conform to all the requirements in ASTM C 94 applicable to central-mixed concrete.

#### 3.1.3.2 Truck Mixers

Truck mixers, the mixing of concrete therein, and concrete uniformity shall conform to the requirements of ASTM C 94. A truck mixer may be used either for complete mixing (transit-mixed) or to finish the partial mixing done in a stationary mixer (shrink-mixed). Each truck shall be equipped with two counters from which it will be possible to determine the number of revolutions at mixing speed and the number of revolutions at agitating speed.

#### 3.1.4 Conveying Equipment

The conveying equipment shall conform to the following requirements.

##### 3.1.4.1 Buckets

The interior hopper slope shall be not less than 58 degrees from the horizontal, the minimum dimension of the clear gate opening shall be at least five times the nominal maximum-size aggregate, and the area of the gate opening shall not be less than 2 square feet. The maximum dimension of the gate opening shall not be greater than twice the minimum dimension. The bucket gates shall be essentially grout tight when closed and may be manually, pneumatically, or hydraulically operated except that buckets larger than 2 cubic yards shall not be manually operated. The design of the bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

##### 3.1.4.2 Transfer Hoppers

Concrete may be charged into nonagitating hoppers for transfer to other conveying devices. Transfer hoppers shall be capable of receiving concrete directly from delivery vehicles and have conical-shaped discharge features.

The transfer hopper shall be equipped with a hydraulically operated gate and with a means of external vibration to effect complete discharge. Concrete shall not be held in nonagitating transfer hoppers more than 30 minutes.

##### 3.1.4.3 Trucks

Truck mixers operating at agitating speed or truck agitators used for transporting plant-mixed concrete shall conform to the requirements of ASTM C 94. Nonagitating equipment may be used for transporting plant-mixed concrete over a smooth road when the hauling time is less than 15 minutes. Bodies of nonagitating equipment shall be smooth, watertight, metal containers specifically designed to transport concrete, shaped with rounded corners to minimize segregation, and equipped with gates that will permit



positive control of the discharge of the concrete.

#### 3.1.4.4 Chutes

When concrete can be placed directly from a truck mixer, agitator, or nonagitating equipment, the chutes attached to this equipment by the manufacturer may be used. A discharge deflector shall be used when required by the Contracting Officer. Separate chutes and other similar equipment will not be permitted for conveying concrete.

#### 3.1.4.5 Belt Conveyors

Belt conveyors shall be designed and operated to assure a uniform flow of concrete from mixer to final place of deposit without segregation of ingredients or loss of mortar and shall be provided with positive means for preventing segregation of the concrete at the transfer points and the point of placing. Belt conveyors shall be constructed such that the idler spacing shall not exceed 36 inches. The belt speed shall be a minimum of 300 feet per minute and a maximum of 750 feet per minute. If concrete is to be placed through installed horizontal or sloping reinforcing bars, the conveyor shall discharge concrete into a pipe or elephant trunk that is long enough to extend through the reinforcing bars.

#### 3.1.4.6 Concrete Pumps

Concrete may be conveyed by positive displacement pump when approved. The pumping equipment shall be piston or squeeze pressure. The pipeline shall be rigid steel pipe or heavy-duty flexible hose. The inside diameter of the pipe shall be at least three times the nominal maximum-size coarse aggregate in the concrete mixture to be pumped but not less than 4 inches. Aluminum pipe shall not be used.

#### 3.1.5 Vibrators

Vibrators of the proper size, frequency, and amplitude shall be used for the type of work being performed in conformance with the following requirements:

APPLICATION	HEAD DIAMETER INCHES	FREQUENCY VPM	AMPLITUDE INCHES
Thin walls, beams, etc.	1-1/4 to 2-1/2	9,000 to 13,500	0.02 to 0.04
General construction	2 to 3-1/2	8,000 to 12,000	0.025 to 0.05

The frequency and amplitude shall be determined in accordance with COE CRD-C 521.

### 3.2 PREPARATION FOR PLACING

#### 3.2.1 Embedded Items

Before placement of concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated on

the drawings, or required. Embedded items shall be free of oil and other foreign matter such as loose coatings or rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable materials to prevent the entry of concrete into voids. Welding, including tack welding, will not be permitted on embedded metals within 2 feet of the surface of the concrete.

### 3.2.2 Concrete on Earth Foundations

Earth surfaces upon which concrete is to be placed shall be clean, damp, and free from debris, frost, ice, and standing or running water. Prior to placement of concrete, the earth foundation shall have been satisfactorily compacted in accordance with Section 02221 EXCAVATION, FILLING, AND BACKFILLING FOR STRUCTURES..

### 3.2.3 Construction Joint Treatment

Construction joint treatment shall conform to the following requirements.

#### 3.2.3.1 Joint Preparation

Concrete surfaces to which additional concrete is to be bonded shall be prepared for receiving the next lift or adjacent concrete by cleaning with either air-water cutting, sandblasting, high-pressure water jet, or other approved method. Air-water cutting will not be permitted on formed surfaces or surfaces congested with reinforcing steel. Regardless of the method used, the resulting surfaces shall be free from all laitance and inferior concrete so that clean, well bonded coarse aggregate is exposed uniformly throughout the lift surface. The edges of the coarse aggregate shall not be undercut. The surface shall be washed clean again as the last operation prior to placing the next lift. There shall be no standing water on the surface upon which concrete is placed.

#### 3.2.3.2 Air-Water Cutting

Air-water cutting of a construction joint shall be performed at the proper time and only on horizontal construction joints. The air pressure used in the jet shall be 90 to 110 psi, and the water pressure shall be just sufficient to bring the water into effective influence of the air pressure.

When approved by the Contracting Officer, a retarder complying with the requirements of COE CRD-C 94 may be applied to the surface of the lift to prolong the period of time during which air-water cutting is effective. Prior to receiving approval, the Contractor shall furnish samples of the material to be used and shall demonstrate the method to be used in applications. After cutting, the surface shall be washed and rinsed as long as there is any trace of cloudiness of the wash water. Where necessary to remove accumulated laitance, coatings, stains, debris, and other foreign material, high-pressure water jet or sandblasting will be required as the last operation before placing the next lift.

#### 3.2.3.3 High-Pressure Water Jet

A stream of water under a pressure of not less than 3,000 psi may be used

for cleaning. Its use shall be delayed until the concrete is sufficiently hard so that only the surface skin or mortar is removed and there is no undercutting of coarse-aggregate particles. If the water jet is incapable of a satisfactory cleaning, the surface shall be cleaned by sandblasting.

#### 3.2.3.4 Wet Sandblasting

This method may be used when the concrete has reached sufficient strength to prevent undercutting of the coarse aggregate particles. The surface of the concrete shall then be washed thoroughly to remove all loose materials.

#### 3.2.3.5 Waste Disposal

The method used in disposing of waste water employed in cutting, washing, and rinsing of concrete surfaces shall be such that the waste water does not stain, discolor, or affect exposed surfaces of the structures, or damage the environment of the project area. The method of disposal shall be subject to approval.

### 3.3 PLACING

#### 3.3.1 Placing Procedures

The surfaces of horizontal construction joints shall be kept continuously wet for the first 12 hours during the 24-hour period prior to placing concrete. Surfaces may be dampened immediately before placement if necessary. Concrete placement will not be permitted when, in the opinion of the Contracting Officer, weather conditions prevent proper placement and consolidation. Concrete shall be deposited as close as possible to its final position in the forms and, in so depositing, there shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it may be effectively consolidated in horizontal layers 2.0 feet or less in thickness with a minimum of lateral movement. The amount deposited in each location shall be that which can be readily and thoroughly consolidated. Sufficient placing capacity shall be provided so that concrete placement can be kept plastic and free of cold joints while concrete is being placed. Concrete shall be placed by methods that will prevent segregation or loss of ingredients. Any concrete transferred from one conveying device to another shall be passed through a hopper that is conical in shape. The concrete shall not be dropped vertically more than 5 feet, except where a properly designed and sized elephant truck with rigid drop chute bottom section is provided to prevent segregation and where specifically authorized. In no case will concrete be discharged to free-fall through reinforcing bars.

#### 3.3.2 Placement by Pump

When concrete is to be placed by pump, the nominal maximum-size coarse aggregate shall not be reduced to accommodate the pumps. The distance to be pumped shall not exceed limits recommended by the pump manufacturer. The concrete shall be supplied to the concrete pump continuously. When pumping is completed, concrete remaining in the pipeline shall be ejected without contamination of concrete in place. After each operation,

equipment shall be thoroughly cleaned, and flushing water shall be wasted outside of the forms. Grout used to lubricate the pumping equipment at the beginning of the placement will not be incorporated into the placement.

#### 3.3.3 Time Interval Between Mixing and Placing

Concrete shall be placed within 30 minutes after discharge into nonagitating equipment. When concrete is truck-mixed or when a truck mixer or agitator is used for transporting concrete mixed by a concrete plant mixer, the concrete shall be delivered to the site of the work, and discharge shall be completed within 1-1/2 hours after introduction of the cement to the aggregates. When the length of haul makes it impossible to deliver truck-mixed concrete within these time limits, batching of cement and a portion of the mixing water shall be delayed until the truck mixer is at or near the construction site.

#### 3.3.4 Cold-Weather Placing

When cold-weather placing of concrete is likely to be subjected to freezing temperatures before the expiration of the curing period, it shall be placed in accordance with procedures previously submitted in accordance with paragraph SUBMITTALS. The ambient temperature of the space adjacent to the concrete placement and surfaces to receive concrete shall be above 32 degrees F. The placing temperature of the concrete having a minimum dimension less than 12 inches shall be between 55 and 75 degrees F when measured in accordance with ASTM C 1064. The placing temperature of the concrete having a minimum dimension greater than 12 inches shall be between 50 and 70 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete-placing temperatures. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals, or other materials shall not be mixed with the concrete to prevent freezing.

#### 3.3.5 Hot-Weather Placing

Concrete shall be properly placed and finished with procedures previously submitted in accordance with paragraph SUBMITTALS. The concrete-placing temperature shall not exceed 85 degrees F when measured in accordance with ASTM C 1064. Cooling of the mixing water and aggregates, or both, may be required to obtain an adequate placing temperature. A retarder meeting the requirements of paragraph WATER-REDUCING OR RETARDING ADMIXTURES may be used to facilitate placing and finishing. Steel forms and reinforcement shall be cooled prior to concrete placement when steel temperatures are greater than 120 degrees F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature.

#### 3.3.6 Consolidation

Immediately after placement, each layer of concrete, including flowing concrete, shall be consolidated by internal vibrating equipment. Vibrators shall not be used to transport concrete within the forms. Hand spading may be required, if necessary, with internal vibrating along formed surfaces permanently exposed to view. Form or surface vibrators shall not be used unless specifically approved. The vibrator shall be inserted vertically at uniform spacing over the entire area of placement. The distance between

insertions shall be approximately 1-1/2 times the radius of action of the vibrator. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding unhardened layer if such exists. It shall be held stationary until the concrete is consolidated and then withdrawn slowly.

### 3.4 FINISHING

The ambient temperature of spaces adjacent to surfaces being finished shall be not less than 40 degrees F. In hot weather when the rate of evaporation of surface moisture, as determined by use of Figure 2.1.5 of ACI 305R, may reasonably be expected to exceed 0.2 pounds per square foot per hour. Provisions for windbreaks, shading, fog spraying, or wet covering with a light-colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as finishing operations will allow. All unformed surfaces that are not to be covered by additional concrete or backfill shall have a float finish. Additional finishing shall be as specified below and shall be true to the elevation shown in the drawings. Surfaces to receive additional concrete or backfill shall be brought to the elevation shown on the drawings and left true and regular. Exterior surfaces shall be sloped for drainage unless otherwise shown in the drawing or as directed. Joints shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. Grate tampers or jitterbugs shall not be used.

#### 3.4.1 Unformed Surfaces

##### 3.4.1.1 Float Finish

Surfaces shall be screeded and darbied or bullfloated to bring the surface to the required finish level with no coarse aggregate visible. No water, cement, or mortar shall be added to the surface during the finishing operation. The concrete, while still green but sufficiently hardened to bear a man's weight without deep imprint, shall be floated to a true and even plane. Floating may be performed by use of suitable hand floats or power-driven equipment. Hand floats shall be made of magnesium or aluminum.

##### 3.4.1.2 Broom Finish

A broom finish shall be applied to all surfaces exposed to public view. The concrete surface shall be finished with a float finish. The floated surface shall be broomed with a fiber-bristle brush in a direction transverse to that of the main traffic.

#### 3.4.2 Formed Surfaces

Unless another finish is specified, surfaces shall be left with the texture imparted by the forms except that defective surfaces shall be repaired as described in paragraph 3.4.3 Formed Surface Repair.

##### 3.4.3 Formed Surface Repair

After removal of forms, all ridges, lips, and bulges on surfaces permanently exposed shall be removed. All repairs shall be completed

within 48 hours after form removal.

#### 3.4.3.1 Classes A, AHV, & B Finishes

Surfaces listed in Section 03101 FORMWORK FOR CONCRETE and as shown to have classes A, AHV, and B finishes shall have surface defects repaired as follows: defective areas, voids, and honeycombs smaller than 16 square inches in area and less than 1/2 inch deep and bug holes exceeding 1/2 inch in diameter shall be chipped and filled with dry-packed mortar. Holes left by removal of tie rods shall be reamed and filled with dry-packed mortar as specified in paragraph MATERIAL AND PROCEDURE FOR REPAIRS. Defective and unsound concrete areas larger than described shall be defined by 1/2 inch deep dovetailed saw cuts in a rectangular pattern with lines parallel to the formwork, the defective concrete removed by chipping, and the void repaired with replacement concrete. The prepared area shall be brush-coated with an epoxy resin meeting the requirements of paragraph EPOXY RESIN, a latex bonding agent meeting the requirements of paragraph LATEX BONDING COMPOUND, or a neat cement grout after dampening the area with water. The void shall be filled with replacement concrete in accordance with paragraph MATERIAL AND PROCEDURE FOR REPAIRS.

#### 3.4.3.2 Class C Finish

Surfaces listed in Section 03101 FORMWORK FOR CONCRETE and as shown shall have defects repaired as follows: defective areas, voids, and honeycombs smaller than 24 square inches and less than 2 inches deep; bug holes exceeding 1-1/2 inches in diameter shall be chipped and filled with dry-packed mortar; and holes left by removal of the tie rods shall be chipped and filled with dry-packed mortar. Defective and unsound concrete areas larger than 24 square inches and deeper than 1-1/2 inches shall be defined by 1/2 inch deep dovetailed saw cuts in a rectangular pattern, the defective concrete removed by chipping, and the void repaired with replacement concrete. The prepared area shall be brush-coated with an epoxy resin meeting the requirements of paragraph EPOXY RESIN, a latex bonding agent meeting the requirements of paragraph LATEX BONDING COMPOUND, or a neat cement grout after dampening the area with water. The void shall be filled with replacement concrete in accordance with paragraph MATERIAL AND PROCEDURE FOR REPAIRS.

#### 3.4.3.3 Class D Finish

Surfaces listed in Section 03101 FORMWORK FOR CONCRETE and as shown to have class D finish shall have surface defects repaired as follows: defective areas, voids, and honeycombs greater than 48 square inches in area or more than 2 inches deep shall be defined by 1/2 inch deep dovetailed saw cuts in a rectangular pattern, the defective concrete removed by chipping and the void repaired with replacement concrete. The prepared area shall be brush-coated with an epoxy resin meeting the requirements of paragraph EPOXY RESIN, a latex bonding agent meeting the requirements of paragraph LATEX BONDING COMPOUND, or a neat cement grout after dampening the area with water. The void shall be filled with replacement concrete in accordance with paragraph MATERIAL AND PROCEDURE FOR REPAIRS.

#### 3.4.3.4 Material and Procedure for Repairs

The cement used in the dry-packed mortar or replacement concrete shall be a blend of the cement used for production of project concrete and white portland cement properly proportioned so that the final color of the mortar or concrete will match adjacent concrete. Trial batches shall be used to determine the proportions required to match colors. Dry-packed mortar shall consist of one part cement to two and one-half parts fine aggregate. The fine aggregate shall be that used for production of project concrete. The mortar shall be remixed over a period of at least 30 minutes without addition of water until it obtains the stiffest consistency that will permit placing. Mortar shall be thoroughly compacted into the prepared void by tamping, rodding, ramming, etc. and struck off to match adjacent concrete. Replacement concrete shall be produced using project materials and shall be proportioned by the Contracting Officer. It shall be thoroughly compacted into the prepared void by internal vibration, tamping, rodding, ramming, etc. and shall be struck off and finished to match adjacent concrete. Forms shall be used to confine the concrete. If an expanding agent is used in the repair concrete, the repair shall be thoroughly confined on all sides including the top surface. Metal tools shall not be used to finish permanently exposed surfaces. The repaired areas shall be cured for 7 days. The temperature of the in situ concrete, adjacent air, and replacement mortar or concrete shall be above 40 degrees F during placement, finishing, and curing. Other methods and materials for repair may be used only when approved in writing by the Contracting Officer. Repairs of the so called "plaster-type" will not be permitted.

### 3.5 CURING AND PROTECTION

#### 3.5.1 Duration

The length of the curing period shall be determined by the type of cementitious material, as specified below. Concrete shall be cured by an approved method.

Type III portland cement _____	3 days
Type I portland cement _____	7 days
Type II portland cement _____	14 days

Immediately after placement, concrete shall be protected from premature drying, extremes in temperatures, rapid temperature change, and mechanical damage. All materials and equipment needed for adequate curing and protection shall be available and at the placement site prior to the start of concrete placement. Concrete shall be protected from the damaging effects of rain for 12 hours and from flowing water for 14 days (7 days with Type III cement). No fire or excessive heat including welding shall be permitted near or in direct contact with concrete or concrete embedments at any time.

#### 3.5.2 Moist Curing

Moist-cured concrete shall be maintained continuously, not periodically,

wet for the entire curing period. If water or curing materials stain or discolor concrete surfaces that are to be permanently exposed, they shall be cleaned as required in paragraph APPEARANCE. Where wooden form sheathing is left in place during curing, the sheathing shall be kept wet at all times. Where steel forms are left in place during curing, the forms shall be carefully broken loose from the hardened concrete and curing water continuously applied into the void so as to continuously saturate the entire concrete surface. Horizontal surfaces may be moist cured by ponding, by covering with a minimum uniform thickness of 2 inches of continuously saturated sand, or by covering with saturated nonstaining burlap or cotton mats. Horizontal construction joints may be allowed to dry for 12 hours immediately prior to the placing of the following lift. Silica fume concrete, if used, shall be moist-cured. Curing of silica fume concrete shall start immediately after placement.

### 3.5.3 Membrane-Forming Curing Compound

Concrete may be cured with an approved membrane-forming curing compound in lieu of moist curing except that membrane curing will not be permitted on any surface to which a grout-cleaned finish is to be applied or other concrete is to be bonded, on any surface containing protruding steel reinforcement, on an abrasive aggregate finish, or any surface maintained at curing temperature by use of free steam. A styrene acrylate or chlorinated rubber compound may be used for surfaces that are to be painted or are to receive bituminous roofing or waterproofing, or for floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing, or flooring specified.

#### 3.5.3.1 Pigmented Curing Compound

A pigmented curing compound meeting the requirements of the above paragraph MEMBRANE-FORMING CURING COMPOUND may be used on surfaces that will not be exposed to view when the project is completed.

#### 3.5.3.2 Nonpigmented Curing Compound

A nonpigmented curing compound containing a fugitive dye may be used on surfaces that will be exposed to view when the project is completed. Concrete cured with nonpigmented curing compound must be shaded from the sun for the first 3 days when the ambient temperature is 90 degrees F or higher.

#### 3.5.3.3 Application

The curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. The surfaces shall be thoroughly moistened with water, and the curing compound applied as soon as free water disappears. The curing compound shall be applied to unformed surfaces as soon as free water has disappeared and bleeding has stopped. The curing compound shall be applied in a two-coat continuous operation by approved motorized power-spraying equipment operating at a minimum pressure of 75 psi, at a uniform coverage



of not more than 400 square feet per gallon for each coat, and the second coat shall be applied perpendicular to the first coat. Concrete surfaces that have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage specified. All concrete surfaces on which the curing compound has been applied shall be adequately protected for the duration of the entire curing period from pedestrian and vehicular traffic and from any other cause that will disrupt the continuity of the curing membrane.

#### 3.5.4 Evaporation Retardant

Sheet curing shall not be used on vertical or near-vertical surfaces. All surfaces shall be thoroughly wetted and be completely covered with waterproof paper or polyethylene-coated burlap having the burlap thoroughly water-saturated before placing. Covering shall be laid with light-colored side up. Covering shall be lapped not less than 12 inches and securely weighted down or shall be lapped not less than 4 inches and taped to form a continuous cover with completely closed joints. The sheet shall be weighted to prevent displacement so that it remains in contact with the concrete during the specified length of curing. Coverings shall be folded down over exposed edges of slabs and secured by approved means. Sheets shall be immediately repaired or replaced if tears or holes appear during the curing period.

#### 3.5.5 Cold-Weather Curing and Protection

When the daily outdoor low temperature is less than 32 degrees F, the temperature of the concrete shall be maintained above 40 degrees F for the first 7 days after placing. In addition, during the period of protection removal, the air temperature adjacent to the concrete surfaces shall be controlled so that concrete near the surface will not be subjected to a temperature differential of more than 25 degrees F as determined by observation of ambient and concrete temperatures indicated by suitable temperatures measuring devices furnished by the Government as required and installed adjacent to the concrete surface and 2 inches inside the surface of the concrete. The installation of the thermometers shall be made by the Contractor at such locations as may be directed.

### 3.6 CURING

Grout and parge coats shall be cured in conformance with paragraph CURING AND PROTECTION.

### 3.7 FLOODWALL PAINTING

Exposed faces of concrete floodwalls will be covered with a graffiti-resistant polyurethane enamel.

#### 3.7.1 Preparation of Concrete Floodwall Surface

- a. Curing: Concrete surfaces shall be allowed to cure at least 30 days before painting.
- b. Surface Cleaning: Remove the following deleterious substances.

(1) Dirt, Grease, and Oil: Wash new surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, and 4 quarts of warm water. Then rinse thoroughly with fresh water. For large areas, water blasting may be used.

(2) Fungus and Mold: Wash new surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, 1 quart of 5 percent sodium hypochlorite solution, and 3 quarts of warm water. Then rinse thoroughly with fresh water.

(3) Paint and Loose Particles: Remove by wire brushing.

(4) Efflorescence: Remove by scraping or wire brushing, followed by washing with a 5 to 10 percent by weight aqueous solution of hydrochloric (muriatic) acid. Do not allow acid to remain on the surface for more than 5 minutes before rinsing with fresh water. Do not acid clean more than 4 square feet of surface, per workman, at one time.

c. Cosmetic Repairs of Minor Defects: Repairs or fill mortar joints and minor defects including, but not limited to, spalls, in accordance with manufacturer's recommendations and prior to coating application.

d. Allowable Moisture Content: In all cases follow manufacturer's recommendations. Allow surfaces to cure a minimum of 30 days before painting.

### 3.7.2 Application Recommendations

a. Application: Surfaces must be clean and dry before application. Grease, oil, waxy substances, dirt, etc. must be cleaned from the surface. Enamel should be applied by brush, squeegee, or foam applicator.

b. Coverage Recommendations

Concrete -- 100-150 sq. ft./gallon.  
Recommended film thickness:

Wet: 12-15 mils.  
Dry: 5-7 mils/coat.

## 3.8 TESTS AND INSPECTIONS

Tests and inspections shall conform to the following requirements.

### 3.8.1 General

The Contractor shall perform the inspections and tests described below, and, based upon the results of these inspections and tests, he shall take the action required and submit reports as required. When, in the opinion of the Contracting Officer, the concreting operation is out of control, concrete placement shall cease. The laboratory performing the tests shall be on site and shall conform with ASTM C 1077. The individuals who sample and test concrete or the constituents of concrete as required in this specification shall have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI minimum guidelines for certification of Concrete Field Testing Technicians, Grade I. The individuals who perform the inspection of concrete construction shall have demonstrated a knowledge and ability equivalent to the ACI minimum guidelines for certification of Concrete Construction Inspector, Level II. The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations and at least once per year thereafter for conformance with ASTM C 1077.

### 3.8.2 Testing and Inspection Requirements

#### 3.8.2.1 Fine Aggregate

a. Grading - At least once during each shift when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C 136 and COE CRD-C 104 for the fine aggregate or for each size range of fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits.

b. Corrective Action for Fine Aggregate Grading - When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall immediately be reported to the Contracting Officer.

c. Moisture Content Testing - When in the opinion of the Contracting Officer the electric moisture meter is not operating satisfactorily, there shall be at least four tests for moisture content in accordance with ASTM C 566 during each 8-hour period of mixing plant operation. The times for the tests shall be selected randomly within the 8-hour period. An additional test shall be made whenever the slump is shown to be out of control or excessive variation in workability is reported by the placing foreman. When the electric moisture meter is operating satisfactorily, at least two direct measurements of moisture content shall be made per week to check the calibration of the meter. The results of tests for moisture content shall be used to adjust the added water in the control of the batch plant.

d. Moisture Content Corrective Action - Whenever the moisture content of the fine aggregate changes by 0.5 percent or more, the scale settings for the fine-aggregate batcher and water batcher shall be

adjusted (directly or by means of a moisture compensation device) if necessary to maintain the specified slump.

#### 3.8.2.2 Coarse Aggregate

a. Grading - At least once during each shift in which the concrete plant is operating, there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt limits for control which are coarser than the specification limits for samples taken at locations other than as delivered to the mixer to allow for degradation during handling.

b. Corrective Action for Grading - When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer. Where two consecutive averages of five tests are outside specification limits, the operation shall be considered out of control and shall be reported to the Contracting Officer. Concreting shall be stopped and immediate steps shall be taken to correct the grading.

c. Coarse Aggregate Moisture Content - A test for moisture content of each size group of coarse aggregate shall be made at least twice per week. When two consecutive readings for smallest size coarse aggregate differ by more than 1.0 percent, frequency of testing shall be increased to that specified above for fine aggregate, until the difference falls below 1.0 percent.

d. Coarse Aggregate Moisture Corrective Action - Whenever the moisture content of any size of coarse aggregate changes by 0.5 percent or more, the scale setting for the coarse aggregate batcher and the water batcher shall be adjusted if necessary to maintain the specified slump.

#### 3.8.2.3 Quality of Aggregates

a. Frequency of Quality Tests - Thirty days prior to the start of concrete placement the Contractor shall perform all tests for aggregate quality listed below. In addition, after the start of concrete placement, the Contractor shall perform tests for aggregate quality in accordance with the frequency schedule shown below. Samples tested after the start of concrete placement shall be taken immediately prior to entering the concrete mixer.

PROPERTY	FREQUENCY		TEST
	FINE AGGREGATE	COARSE AGGREGATE	
Specific Gravity	Every 3 months	Every 3 months	ASTM C 127 ASTM C 128
Absorption	Every 3 months	Every 3 months	ASTM C 127 ASTM C 128
Durability Factor Using, (Procedure A)	Every 12 months	Every 12 months	COE CRD-C 114 ASTM C 666
Clay Lumps and Friable Particles	Every 3 months	Every 3 months	ASTM C 142
Material Finer than the 75- $\mu$ m (No. 200) Sieve	Not applicable	Every 3 months	ASTM C 117
Impurities	Every 3 months	Not applicable	ASTM C 40 ASTM C 87
A.L. Abrasion	Not applicable	Every 6 months	ASTM C 131 ASTM C 535
Soft and Friable (Scratch Hardness)	Not applicable	Every 6 months	COE CRD-C 130
Petrographic Examination	Every 6 months	Every 6 months	ASTM C 295
Chert, less than 2.40 specific gravity	Every 6 months	Every 6 months	ASTM C 123
Coal and Lignite, less than 2.00 gravity	Every 6 months	Every 6 months	ASTM C 123

b. Corrective Action for Aggregate Quality - If the result of a quality test fails to meet the requirements for quality immediately prior to start of concrete placement, production procedures or materials shall be changed and additional tests shall be performed until the material meets the quality requirements prior to proceeding with either mixture proportioning studies or starting concrete placement. After concrete placement commences, whenever the result of a test for quality fails the requirements, the test shall be rerun immediately. If the second test fails the quality requirement, the

fact shall be reported to the Contracting Officer and immediate steps taken to rectify the situation.

#### 3.8.2.4 Scales

- a. Weighing Accuracy - The accuracy of the scales shall be checked by test weights prior to start of concrete operations and at least once every 3 months for conformance with the applicable requirements of paragraph BATCHING EQUIPMENT. Such tests shall also be made as directed whenever there are variations in properties of the fresh concrete that could result from batching errors.
- b. Batching and Recording Accuracy - Once a week the accuracy of each batching and recording device shall be checked during a weighing operation by noting and recording the required weight, recorded weight, and the actual weight batched. The Contractor shall confirm that the calibration devices described in paragraph BATCH PLANT for checking the accuracy of dispensed admixtures are operating properly.
- c. Scales Corrective Action - When either the weighing accuracy or batching accuracy does not comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made. Discrepancies in recording accuracies shall be corrected immediately.

#### 3.8.2.5 Batch-Plant Control

The measurement of all constituent materials including cementitious materials, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate weights and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic yard, amount of water as free moisture in each size of aggregate, and the batch aggregate and water weights per cubic yard for each class of concrete batched during plant operation.

#### 3.8.2.6 Concrete Mixture

- a. Air Content Testing - Air content tests shall be made when test specimens are fabricated. In addition, at least two tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of concrete production. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government quality assurance representative. Tests shall be made in accordance with ASTM C 231. Test results shall be plotted on control charts which shall at all times be readily available to the Government. Copies of the current control charts shall be kept in the field by the Contractor's quality control representatives and results plotted as tests are made. When a single test result reaches either the upper or lower action

limit a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the air content of the batch to plot on both the control chart for air content and the control chart for range, and for determining the need for any remedial action. The result of each test, or average as noted in the previous sentence, shall be plotted on a separate chart for each mixture on which an "average line" is set at the midpoint of the specified air content range from paragraph AIR CONTENT. An upper warning limit and a lower warning limit line shall be set 1.0 percentage point above and below the average line. An upper action limit and a lower action limit line shall be set 1.5 percentage points above and below the average line, respectively. The range between each two consecutive tests shall be plotted on a control chart for range where an upper warning limit is set at 2.0 percentage points and up upper action limit is set at 3.0 percentage points. Samples for air content may be taken at the mixer, however, the Contractor is responsible for delivering the concrete to the placement site at the stipulated air content. If the Contractor's materials or transportation methods cause air content loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer and the air content at the mixer controlled as directed.

b. Air Content Corrective Action - Whenever points on the control chart for percent air reach either warning limit, an adjustment shall immediately be made in the amount of air-entraining admixture batched. As soon as is practical after each adjustment, another test shall be made to verify the result of the adjustment. Whenever a point on the control chart range reaches the warning limit, the admixture dispenser shall be recalibrated to ensure that it is operating accurately and with good reproducibility. Whenever a point on either control chart reaches an action limit line, the air content shall be considered out of control and the concreting operation shall immediately be halted until the air content is under control. Additional air content tests shall be made when concreting is restarted. All this shall be at no extra cost to the Government.

c. Slump Testing - In addition to slump tests which shall be made when test specimens are fabricated, at least four slump tests shall be made on randomly selected batches in accordance with ASTM C 143 for each separate concrete mixture produced during each 8-hour or less period of concrete production each day. Also, additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government's quality assurance representative. Test results shall be plotted on control charts which shall at all times be readily available to the Government. Copies of the current control charts shall be kept in the field by the Contractor's quality control representatives and results plotted as tests are made. When a single slump test reaches or goes beyond either the upper or lower action limit, a second test shall immediately be made on the same batch of concrete. The results of the two tests shall be averaged and this average used as the slump of the batch to plot on both the control chart for percent air and the chart for range, and for determining the need for any remedial action. An upper warning limit shall be set at 1/2 inch below the maximum allowable slump on separate control charts

for percent air used for each type of mixture as specified in paragraph SLUMP, and an upper action limit line and lower action limit line shall be set at the maximum and minimum allowable slumps, respectively, as specified in the same paragraph. The range between each consecutive slump test for each type of mixture shall be plotted on a single control chart for range on which an upper action limit is set at 2 inches. Samples for slump shall be taken at the mixer, however, the Contractor is responsible for delivering the concrete to the placement site at the stipulated slump. If the Contractor's materials or transportation methods cause slump loss between mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer and the slump at the mixer controlled as directed.

d. Slump Corrective Action - Whenever points on the control chart for slump reach the upper warning limit, an adjustment shall be immediately made in the batch weights of water and fine aggregate. The adjustments are to be made so that the total water content does not exceed that amount allowed by the maximum W/C specified, based upon aggregates which are in a saturated surface-dry condition. When a single slump reaches the upper or lower action limit, no further concrete shall be delivered to the placing site until proper adjustments have been made. Immediately after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever two consecutive slump tests, made during a period when there was no adjustment of batch weights, produce a point on the control chart for range at or above the upper action limit, the concreting operation shall immediately be halted and the Contractor shall take appropriate steps to bring the slump under control. Also, additional slump tests shall be made as directed. All this shall be at no additional cost to the Government.

e. Temperature - The temperature of the concrete shall be measured when compressive strength specimens are fabricated. Measurement shall be in accordance with ASTM C 1064. The temperature shall be reported along with the compressive strength data.

f. Compressive-Strength Specimens - At least one set of test specimens shall be made each day on each different concrete mixture placed during the day. Additional sets of test cylinders shall be made, as directed by the Contracting Officer, when the mixture proportions are changed or when low strengths have been detected. A random sampling plan shall be developed by the Contractor and approved by the Contracting Officer prior to the start of construction. The plan shall assure that sampling is done in a completely random and unbiased manner. A set of test specimens for concrete with a 28-day specified strength per paragraph DESIGN REQUIREMENTS shall consist of four cylinders, two to be tested at 7 days and two at 28 days. A set of test specimens for concrete with a 90-day strength per specified paragraph DESIGN REQUIREMENTS shall consist of six cylinders, two tested at 7 days, two at 28 days, and two at 90 days. Test specimens shall be molded and cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39. All compressive-strength tests shall be reported immediately to the Contracting Officer. Quality control charts shall be kept for individual strength tests, moving average for strength, and moving



average for range for each mixture. The charts shall be similar to those found in ACI 214.

#### 3.8.2.7 Inspection Before Placing

Foundation or construction joints, forms, and embedded items shall be inspected for quality by the Contractor in sufficient time prior to each concrete placement to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

#### 3.8.2.8 Placing

a. Placing Inspection - The placing foreman shall supervise all placing operations, shall determine that the correct quality of concrete or grout is placed in each location as directed and shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, yardage placed, and method of placement.

b. Placing Corrective Action - The placing foreman shall not permit batching and placing to begin until he has verified that an adequate number of vibrators in working order and with competent operators are available. Placing shall not be continued if any pile of concrete is inadequately consolidated. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature controls.

#### 3.8.2.9 Vibrators

a. Vibrator Testing and Use - The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521 prior to initial use and at least once a month when concrete is being placed. Additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined at the same time the vibrator is operating in concrete with the tachometer held against the upper end of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two measurements shall be taken, one near the tip and another near the upper end of the vibrator head and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing.

b. Vibrator Corrective Action - Any vibrator not meeting the requirements of paragraph VIBRATORS shall be immediately removed from service and repaired or replaced.

#### 3.8.2.10 Curing

a. Moist-Curing Inspections - At least once each shift, and once per day on nonwork days an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.

b. Moist-Curing Corrective Action - When a daily inspection report lists an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for such areas shall be extended by one (1) day.

c. Membrane-Curing Inspection - No curing compound shall be applied until the Contractor's authorized representative has verified that the compound is properly mixed and ready for spraying. At the end of each operation, he shall estimate the quantity of compound used by measurement of the container and the area of concrete surface covered and compute the rate of coverage in square feet per gallon. He shall note whether or not coverage is uniform.

d. Membrane-Curing Corrective Action - When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.

e. Sheet-Curing Inspection - At least once each shift and once per day on nonwork days, an inspection shall be made of all areas being cured using material sheets. The condition of the covering and the tightness of the laps and tapes shall be noted and recorded.

f. Sheet-Curing Corrective Action - When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, the tears and holes shall promptly be repaired or the sheets replaced, the joints closed, and the required curing period for those areas shall be extended by one (1) day.

#### 3.8.2.11 Cold-Weather Protection and Sealed Insulation Curing

At least once each shift and once per day on nonwork days, an inspection shall be made of all areas subject to cold-weather protection. The protection system shall be inspected for holes, tears, unsealed joints, or other deficiencies that could result in damage to the concrete. Special attention shall be taken at edges, corners, and thin sections. Any deficiencies shall be noted, corrected, and reported.

#### 3.8.2.12 Cold-Weather Protection Corrective Action

When a daily inspection report lists any holes, tears, unsealed joints, or other deficiencies, the deficiency shall be corrected immediately and the period of protection extended 1 day.

#### 3.8.2.13 Mixer Uniformity

a. Stationary Mixers - Prior to the start of concrete placing and once every 6 months when concrete is being placed, or once for every 75,000 cubic yards of concrete placed, whichever results in the longest time interval, uniformity of concrete mixing shall be determined in accordance with ASTM C 94.

b. Truck Mixers - Prior to the start of concrete placing and at least once every 6 months when concrete is being placed, uniformity of

concrete shall be determined in accordance with ASTM C 94. The truck mixers shall be selected randomly for testing. When satisfactory performance is found in one truck mixer, the performance of mixers of substantially the same design and condition of the blades may be regarded as satisfactory.

#### 3.8.2.14 Mixer Uniformity Corrective Action

When a mixer fails to meet mixer uniformity requirements, either the mixer shall be removed from service on the work, the mixing time shall be increased, batching sequence changed, batch size reduced, or adjustments shall be made to the mixer until compliance is achieved.

#### 3.8.3 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. During periods of cold-weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be confirmed in writing in the routine reports. The Contracting Officer has the right to examine all test and inspection records.

\_\_\_\_\_, 19\_\_

## LIST OF FINE AND COURSE AGGREGATE SOURCES

LAT/LONG	PIT LOCATION, ADDRESS AND TELEPHONE NUMBER	MAIN OFFICE, ADDRESS AND TELEPHONE NUMBER
	FINE AGGREGATE	
____/____	_____	_____
	_____	_____
____/____	_____	_____
	_____	_____
	_____	_____
____/____	_____	_____
	_____	_____
	_____	_____
____/____	_____	_____
	_____	_____
	_____	_____
____/____	_____	_____
	_____	_____
	_____	_____
	COURSE AGGREGATE	
____/____	_____	_____
	_____	_____
	_____	_____
____/____	_____	_____
	_____	_____
	_____	_____
____/____	_____	_____
	_____	_____
	_____	_____
____/____	_____	_____
	_____	_____
	_____	_____

-- End of Section --

## SECTION 05055A

METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS  
**12/92**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN GEAR MANUFACTURERS ASSOCIATION (AGMA)

AGMA 2005	(1996; Rev C) Design Manual for Bevel Gears
AGMA 6001	(1997; Rev D) Design and Selection of Components for Enclosed Gear Drives

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123	(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 325	(1994) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 380	(1994a) Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems
ASTM A 490	(1993) Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
ASTM A 514	(1994a) High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding
ASTM B 177	(1993) Chromium Electroplating on Steel for Engineering Use
ASTM B 766	(1986; R 1993) Electrodeposited Coatings of Cadmium
ASTM A 780	(1993a) Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM D 962	(1981; R 1994) Aluminum Powder and Paste Pigments for Paints
ASTM E 94	(1993) Radiographic Testing

ASTM E 165 (1995) Liquid Penetrant Examination  
Inspection Method

ASTM E 446 (1993) Radiographs for Steel Casting up to  
2 in. (51 mm) in Thickness

ASTM E 709 (1995) Magnetic Particle Examination

ASME INTERNATIONAL (ASME)

ASME B4.1 (1967; R 1994) Preferred Limits and Fits  
for Cylindrical Parts

ASME B46.1 (1985) Surface Texture (Surface Roughness,  
Waviness, and Lay)

ASME BPVC SEC IX (1995) Boiler and Pressure Vessel Code;  
Section IX, Welding and Brazing  
Qualifications

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (1994) Structural Welding Code - Steel

AWS D1.2 (1990) Structural Welding Code - Aluminum

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS 3110 (1992; Rev G) Primer Zinc Chromate

SAE AMS 3132 (1994; Rev F) Varnish, Phenolic Resin  
Corrosion-Preventive

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

Detail Drawings; G, RE

Detail drawings for metalwork and machine work shall be submitted and approved prior to fabrication.

### SD-03 Product Data

Welding of Structural Steel; G, RE

Schedules of welding procedures for steel structures shall be

submitted and approved prior to commencing fabrication.

Welding of Aluminum; G, RE

Schedules of welding processes for aluminum fabrications shall be submitted and approved prior to commencing fabrication.

Structural Steel Welding Repairs; G, RE

Welding repair plans for steel shall be submitted and approved prior to making repairs.

Materials Orders; G, RE

Copies of purchase orders, mill orders, shop orders and work orders for materials shall be submitted prior to the use of the materials in the work.

Materials List; RE

Materials list for fabricated items shall be submitted at the time of submittal of detail drawings.

Shipping Bill; RE

Shipping bill shall be submitted with the delivery of finished pieces to the site.

#### SD-06 Test Reports

Tests, Inspections, and Verifications; G, RE

Certified test reports for materials shall be submitted with all materials delivered to the site.

#### SD-07 Certificates

Qualification of Welders and Welding Operators; G, RE

Certifications for welders and welding operators shall be submitted prior to commencing fabrication.

### 1.3 DETAIL DRAWINGS

Detail drawings for metalwork and machine work shall include catalog cuts, templates, fabrication and assembly details and type, grade and class of material as appropriate. Elements of fabricated items inadvertently omitted on contract drawings shall be detailed by the fabricator and indicated on the detail drawings.

### 1.4 QUALIFICATION OF WELDERS AND WELDING OPERATORS

The Contractor shall certify that the qualification of welders and welding

operators and tack welders who will perform structural steel welding have been qualified for the particular type of work to be done in accordance with the requirements of AWS D1.1, Section 5, or ASME BPVC SEC IX, Section IX, prior to commencing fabrication. The certificate shall list the qualified welders by name and shall specify the code and procedures under which qualified and the date of qualification. Prior qualification will be accepted if welders have performed satisfactory work under the code for which qualified within the preceding three months. The Contractor shall require welders to repeat the qualifying tests when their work indicates a reasonable doubt as to proficiency. Those passing the requalification tests will be recertified. Those not passing will be disqualified until passing. All expenses in connection with qualification and requalification shall be borne by the Contractor.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Materials Orders

The Contractor shall furnish 3 copies of purchase orders, mill orders, shop orders and work orders for all materials orders and items used in the work.

Where mill tests are required purchase orders shall contain the test site address and the name of the testing agency.

#### 2.1.2 Materials List

The Contractor shall furnish a materials list of the materials to be used in the fabrication of each item.

#### 2.1.3 Shipping Bill

The Contractor shall furnish a shipping bill or memorandum of each shipment of finished pieces or members to the project site giving the designation mark and weight of each item, the number of items, the total weight, and the car initial and number if shipped by rail in carload lots. Duplicate copies of shipping bills shall be mailed promptly to the Contracting Officer.

### 2.2 FABRICATION

#### 2.2.1 Structural Fabrication

Material must be straight before being laid off or worked. If straightening is necessary it shall be done by methods that will not impair the metal. Sharp kinks or bends shall be cause for rejection of the material. Material with welds will not be accepted except where welding is definitely specified, indicated or otherwise approved. Bends shall be made by approved dies, press brakes or bending rolls. Where heating is required, precautions shall be taken to avoid overheating the metal and it shall be allowed to cool in a manner that will not impair the original properties of the metal. Proposed flame cutting of material other than structural steel shall be subject to approval and shall be indicated on detail drawings. Shearing shall be accurate and all portions of the work



shall be neatly finished. Corners shall be square and true unless otherwise shown. Re-entrant cuts shall be filleted to a minimum radius of 3/4 inch unless otherwise approved. Finished members shall be free of twists, bends and open joints. Bolts, nuts and screws shall be tight.

#### 2.2.1.1 Dimensional Tolerances for Structural Work

Dimensions shall be measured by an approved calibrated steel tape of approximately the same temperature as the material being measured. The overall dimensions of an assembled structural unit shall be within the tolerances indicated on the drawings or as specified in the particular section of these specifications for the item of work. Where tolerances are not specified in other sections of these specifications or shown, an allowable variation of 1/32 inch is permissible in the overall length of component members with both ends milled and component members without milled ends shall not deviate from the dimensions shown by not more than 1/16 inch for members 30 feet or less in length and by more than 1/8 inch for members over 30 feet in length.

#### 2.2.1.2 Structural Steel Fabrication

Structural steel may be cut by mechanically guided or hand-guided torches, provided an accurate profile with a surface that is smooth and free from cracks and notches is obtained. Surfaces and edges to be welded shall be prepared in accordance with AWS D1.1, Subsection 3.2. Where structural steel is not to be welded, chipping or grinding will not be required except as necessary to remove slag and sharp edges of mechanically guided or hand-guided cuts not exposed to view. Hand-guided cuts which are to be exposed or visible shall be chipped, ground or machined to sound metal.

#### 2.2.2 Welding

##### 2.2.2.1 Welding of Structural Steel

a. Welding Procedures for Structural Steel - Welding procedures for structural steel shall be prequalified as described in AWS D1.1, Subsection 5.1 or shall be qualified by tests as prescribed in AWS D1.1, Section 5. Properly documented evidence of compliance with all requirements of these specifications for previous qualification tests shall establish a welding procedure as prequalified. For welding procedures qualified by tests, the test welding and specimen testing must be witnessed and the test report document signed by the Contracting Officer. Approval of any welding procedure will not relieve the Contractor of the responsibility for producing a finished structure meeting all requirements of these specifications. The Contractor will be directed or authorized to make any changes in previously approved welding procedures that are deemed necessary or desirable by the Contractor Officer. The Contractor shall submit a complete schedule of welding procedures for each steel structure to be welded. The schedule shall conform to the requirements specified in the provisions AWS D1.1, Sections 2, 3, 4, 7 and 9 and applicable provisions of Section 10. The schedule shall provide detailed procedure specifications and tables or diagrams showing the procedures to be used for each required joint. Welding procedures must include

filler metal, preheat, interpass temperature and stress-relief heat treatment requirements. Each welding procedure shall be clearly identified as being prequalified or required to be qualified by tests. Welding procedures must show types and locations of welds designated or in the specifications to receive nondestructive examination.

b. Welding Process - Welding of structural steel shall be by an electric arc welding process using a method which excludes the atmosphere from the molten metal and shall conform to the applicable provisions of AWS D1.1, Sections 1 thru 7, 9, 10 and 11. Welding shall be such as to minimize residual stresses, distortion and shrinkage.

c. Welding Technique

(1) Filler Metal - The electrode, electrode-flux combination and grade of weld metal shall conform to the appropriate AWS specification for the base metal and welding process being used or shall be as shown where a specific choice of AWS specification allowables is required. The AWS designation of the electrodes to be used shall be included in the schedule of welding procedures. Only low hydrogen electrodes shall be used for manual shielded metal-arc welding regardless of the thickness of the steel. A controlled temperature storage oven shall be used at the job site as prescribed by AWS D1.1, Subsection 4.5 to maintain low moisture of low hydrogen electrodes.

(2) Preheat and Interpass Temperature - Preheating shall be performed as required by AWS D1.1, Subsection 4.2 and 4.3 or as otherwise specified except that the temperature of the base metal shall be at least 70 degrees F. The weldments to be preheated shall be slowly and uniformly heated by approved means to the prescribed temperature, held at that temperature until the welding is completed and then permitted to cool slowly in still air.

(3) Stress-Relief Heat Treatment - Where stress relief heat treatment is specified or shown, it shall be in accordance with the requirements of AWS D1.1, Subsection 4.4 unless otherwise authorized or directed.

d. Workmanship - Workmanship for welding shall be in accordance with AWS D1.1, Section 3 and other applicable requirements of these specifications.

(1) Preparation of Base Metal - Prior to welding the Contractor shall inspect surfaces to be welded to assure compliance with AWS D1.1, Subsection 3.2.

(2) Temporary Welds - Temporary welds required for fabrication and erection shall be made under the controlled conditions prescribed for permanent work. Temporary welds shall be made using low-hydrogen welding electrodes and by welders qualified for permanent work as specified in these specifications. Preheating for temporary welds shall be as required by AWS D1.1 for permanent welds except that the minimum temperature shall be 120 degrees F

in any case. In making temporary welds arcs shall not be struck in other than weld locations. Each temporary weld shall be removed and ground flush with adjacent surfaces after serving its purpose.

(3) Tack Welds - Tacks welds that are to be incorporated into the permanent work shall be subject to the same quality requirements as the permanent welds and shall be cleaned and thoroughly fused with permanent welds. Preheating shall be performed as specified above for temporary welds. Multiple-pass tack welds shall have cascaded ends. Defective tack welds shall be removed before permanent welding.

#### 2.2.2.2 Welding of Steel Castings

Unsound material shall be removed from the surfaces of steel castings to be incorporated into welded connections by chipping, machining, air-arc gouging or grinding. Major connections designed for transfer of stresses shall not be welded if the temperature of the casting is lower than 100 degrees F. Castings containing over 0.35 percent carbon or over 0.75 percent manganese shall be preheated to a temperature not to exceed 450 degrees F and welding shall be accomplished while the castings are maintained at a temperature above 350 degrees F. Welding will not be permitted on castings containing carbon in excess of 0.45 percent except on written authorization. Castings requiring welding repairs after the first annealing and castings involving welding fabrication shall be stress-relieved annealed prior to receiving final machining unless otherwise permitted.

#### 2.2.2.3 Welding of Steel Studs

The procedures for welding steel studs to structural steel, including mechanical, workmanship, technique, stud application qualification, production quality control and fabrication and verification inspection procedures shall conform to the requirements of AWS D1.1, Section 7, except as otherwise specified.

a. Application Qualification for Steel Studs - As a condition of approval of the stud application process, the Contractor shall furnish certified test reports and certification that the studs conform to the requirements of AWS D1.1, Subsections 7.2 and 7.3, certified results of the stud manufacturer's stud base qualification test, and certified results of the stud application qualification test as required by AWS D1.1, Subsection 7.6, except as otherwise specified.

b. Production Quality Control - Quality control for production welding of studs shall conform to the requirements of AWS D1.1, Subsection 7.7, except as otherwise specified. Studs on which pre-production testing is to be performed shall be welded in the same general position as required on production studs (flat, vertical, overhead or sloping). If the reduction of the length of studs becomes less than normal as they are welded, welding shall be stopped immediately and not resumed until the cause has been corrected.

### 2.2.3 Bolted Connections

#### 2.2.3.1 Bolted Structural Steel Connections

Bolts, nuts and washers shall be of the type specified or indicated. All nuts shall be equipped with washers except for high strength bolts. Beveled washers shall be used where bearing faces have a slope of more than 1:20 with respect to a plane normal to the bolt axis. Where the use of high strength bolts is specified or indicated the materials, workmanship and installation shall conform to the applicable provisions of ASTM A 325 or ASTM A 490.

a. Bolt Holes - Bolt holes shall be accurately located, smooth, perpendicular to the member and cylindrical.

(1) Holes for regular bolts shall be drilled or subdrilled and reamed in the shop and shall not be more than 1/16 inch larger than the diameter of the bolt.

(2) Holes for fitted bolts shall be match-reamed or drilled in the shop. Burrs resulting from reaming shall be removed. The threads of bolts shall be entirely outside of the holes. The body diameter of bolts shall have tolerances as recommended by ASME B4.1 for the class of fit specified. Fitted bolts shall be fitted in reamed holes by selective assembly to provide an LN-2 fit.

(3) Holes for high strength bolts shall have diameters of not more than 1/16 inch larger than bolt diameters. If the thickness of the material is not greater than the diameter of the bolts the holes may be punched. If the thickness of the material is greater than the diameter of the bolts the holes may be drilled full size or subpunched or subdrilled at least 1/8 inch smaller than the diameter of the bolts and then reamed to full size. Poor matching of holes will be cause for rejection. Drifting occurring during assembly shall not distort the metal or enlarge the holes. Reaming to a larger diameter of the next standard size bolt will be allowed for slight mismatching.

#### 2.2.4 Patterns

Care shall be taken to avoid sharp corners or abrupt changes in cross section and ample fillets shall be used in the construction of patterns. Draft and increases in pattern thicknesses shall be added as required to conform to the standard foundry practice applied and as necessary to ensure that all metal thicknesses of the finished castings conform to the dimensions shown and are within the tolerances specified in paragraph INSPECTION OF STEEL CASTINGS. All patterns shall remain the property of the Contractor.

#### 2.2.5 Castings

Each casting shall bear cast or stamped mark numbers. Castings weighing more than 500 required pounds shall also bear cast or stamped heat numbers. Deviations from the dimensions of castings shown shall not exceed amounts

that will impair the strength of castings by more than 10 percent as computed from the dimensions shown. Dimensions of castings shown on approved detail drawings shall be finished dimensions. Castings that are warped or otherwise distorted or that are oversize to an extent that will interfere with proper fit with other parts of the machinery or structure will be rejected. The structure of metal in castings shall be homogeneous and free from excessive nonmetallic inclusions. Excessive segregation of impurities or alloys at critical points in castings will be cause for rejection. Repairs to castings shall not be made prior to approval. Minor surface imperfections not affecting the strength of casting may be welded in the "green" if approved. Surface imperfections shall be considered minor when the depth of the cavity prepared for welding is the lesser of 20 percent of the actual wall thickness or 1 inch. Defects other than minor surface imperfections may be welded only when specifically authorized in accordance with the following requirements:

- a. The defects have been entirely removed and are judged not to affect the strength, use or machineability of the castings when properly welded and stress relieved.
- b. The proposed welding procedure, stress relief and method of examination of the repair work have been submitted and approved.

#### 2.2.6 Machine Work

Tolerances, allowances and gauges for metal fits between plain, non-threaded, cylindrical parts shall conform to ASME B4.1 for the class of fit shown or required unless otherwise shown on approved detail drawings. Where fits are not shown they shall be suitable as approved. Tolerances for machine-finished surfaces designated by non-decimal dimensions shall be within 1/64 inch. Sufficient machining stock shall be allowed on placing pads to ensure true surfaces of solid material. Finished contact or bearing surfaces shall be true and exact to secure full contact. Journal surfaces shall be polished and all surfaces shall be finished with sufficient smoothness and accuracy to ensure proper operation when assembled. Parts entering any machine shall be accurately machined and all like parts shall be interchangeable except that parts assembled together for drilling or reaming of holes or machining will not be required to be interchangeable with like parts. All drilled holes bolts shall be accurately located.

##### 2.2.6.1 Finished Surfaces

Surface finishes indicated or specified shall be in accordance with ASME B46.1. Values of required roughness heights are arithmetical average deviations expressed in microinches. These values are maximum. Lesser degrees will be satisfactory unless otherwise indicated. Compliance with surface requirements shall be determined by sense of feel and visual inspection of the work compared to Roughness Comparison Specimens in accordance with the provisions of ASME B46.1. Values of roughness width and waviness height shall be consistent with the general type of finish specified by roughness height. Where the finish is not indicated or specified it shall be that which is most suitable for the particular surface, provide the class of fit required and be indicated on the detail

drawings by a symbol which conforms to ASME B46.1 when machine finishing is provided. Flaws such as scratches, ridges, holes, peaks, cracks or checks which will make the part unsuitable for the intended use will be cause for rejection.

#### 2.2.6.2 Unfinished Surfaces

All work shall be laid out to secure proper matching of adjoining unfinished surfaces unless otherwise directed. Where there is a large discrepancy between adjoining unfinished surfaces they shall be chipped and ground smooth or machined to secure proper alignment. Unfinished surfaces shall be true to the lines and dimensions shown and shall be chipped or ground free of all projections and rough spots. Depressions or holes not affecting the strength or usefulness of the parts shall be filled in an approved manner.

#### 2.2.6.3 Pin Holes

Pin holes shall be bored true to gauges, smooth, straight and at right angles to the axis of the member. The boring shall be done after the member is securely fastened in position.

#### 2.2.6.4 Gears

Gears shall have machine cut teeth of a form conforming to applicable design requirements of AGMA 2005 and AGMA 6001 unless otherwise specified or shown.

#### 2.2.6.5 Shafting

All shafting shall be turned or ground hot-rolled or cold-rolled steel as required unless otherwise specified or authorized. Fillets shall be provided where changes in section occur. Cold-finished shafting may be used where keyseating is the only machine work required.

#### 2.2.6.6 Bearings

Bearings may be lined with babbitt or bronze unless otherwise specified or shown. Where the bearing pressure is in excess of 200 psi, bearings shall be lined with bronze. Pressures on lined bearings shall not exceed 400 psi of projected area unless otherwise required or authorized. Anti-friction bearings of approved types and of sizes not less than those recommended by the bearing manufacturer for the duty intended will be permitted subject to approval. All bearings shall be properly aligned and provided with a suitable means of lubrication. Anti-friction bearings shall be so installed as to provide for retention of the lubricant and to exclude dirt and grit.

#### 2.2.7 Miscellaneous Provisions

##### 2.2.7.1 Metallic Coatings

- a. Zinc Coatings - Zinc coatings shall be applied in a manner and of a thickness and quality conforming to ASTM A 123. Where zinc coatings

are destroyed by cutting, welding or other causes the affected areas shall be regalvanized. Coatings 2 ounces or heavier shall be regalvanized with a suitable low-melting zinc base alloy similar to the recommendations of the American Hot-Dip Galvanizers Association to the thickness and quality specified for the original zinc coating. Coatings less than 2 ounces shall be repaired in accordance with ASTM A 780.

b. Cadmium Coatings - Cadmium coatings shall be of a quality and thickness conforming to the requirements of ASTM B 766 and inspection shall conform to the requirements of ASTM E 165.

c. Chromium Coatings - Chromium coatings for engineering use shall be applied in conformity with ASTM B 177.

#### 2.2.7.2 Cleaning of Corrosion-Resisting Steel

Oil, paint and other foreign substances shall be removed from corrosion-resisting steel surfaces after fabrication. Cleaning shall be done by vapor degreasing or by the use of cleaners of the alkaline, emulsion or solvent type. After the surfaces have been cleaned they shall be given a final rinsing with clean water followed by a 24 hour period during which the surfaces are intermittently wet with clean water and then allowed to dry for the purpose of inspecting the clean surfaces. The surfaces shall be visually inspected for evidence of paint, oil, grease, welding slag, heat treatment scale, iron rust or other forms of contamination. If evidence of foreign substance exist the surface shall be cleaned in accordance with the applicable provisions of ASTM A 380. The proposed method of treatment shall be furnished for approval. After treatment the surfaces shall be visually reinspected. Brushes used to remove foreign substances shall have only stainless steel or nonmetallic bristles. Any contamination occurring subsequent to the initial cleaning shall be removed by one or more of the methods indicated above.

#### 2.2.7.3 Lubrication

The arrangement and details for lubrication shall be as shown. Before erection or assembly all bearing surfaces shall be thoroughly cleaned and lubricated with an approved lubricant.

#### 2.2.8 Shop Assembly

Each machinery and structural unit furnished shall be assembled in the shop to determine the correctness of the fabrication and matching of the component parts unless otherwise specified. Tolerances shall not exceed those shown. Each unit assembled shall be closely checked to ensure that all necessary clearances have been provided and that binding does not occur in any moving part. Assembly in the shop shall be in the same position as final installation in the field unless otherwise specified. Assembly and disassembly work shall be performed in the presence of the Contracting Officer unless waived in writing. Errors or defects disclosed shall be immediately remedied by the Contractor without cost to the Government. Before disassembly for shipment each piece of a machinery or structural unit shall be match-marked to facilitate erection in the field. The

location of match-marks shall be indicated by circling with a ring of white paint after the shop coat of paint has been applied or as otherwise directed.

## 2.3 TESTS, INSPECTIONS, AND VERIFICATIONS

The Contractor shall have required material tests and analyses performed and certified by an approved laboratory to demonstrate that materials are in conformity with the specifications. These tests and analyses shall be performed and certified at the Contractor's expense. Tests, inspections, and verifications shall conform to the requirements of the particular sections of these specifications for the respective items of work unless otherwise specified or authorized. Tests shall be conducted in the presence of the Contracting Officer if so required. The Contractor shall furnish specimens and samples for additional independent tests and analyses upon request by the Contracting Officer. Specimens and samples shall be properly labeled and prepared for shipment.

### 2.3.1 Nondestructive Testing

When doubt exists as to the soundness of any material part such part may be subjected to any form of nondestructive testing determined by the Contracting Officer. This may include ultrasonic, magnaflux, dye penetrant, x-ray, gamma ray or any other test that will thoroughly investigate the part in question. The cost of such investigation will be borne by the Government. Any defects will be cause for rejection and rejected parts shall be replaced and retested at the Contractor's expense.

### 2.3.2 Tests of Machinery and Structural Units

The details for tests of machinery and structural units shall conform to the requirements of the particular sections of these specifications covering these items. Each complete machinery and structural unit shall be assembled and tested in the shop in the presence of the Contracting Officer unless otherwise directed. Waiving of tests will not relieve the Contractor of responsibility for any fault in operation, workmanship or material that occurs before the completion of the contract or guarantee. After being installed at the site each complete machinery or structural unit shall be operated through a sufficient number of complete cycles to demonstrate to the satisfaction of the Contracting Officer that it meets the specified operational requirements in all respects.

### 2.3.3 Inspection of Structural Steel Welding

The Contractor shall maintain an approved inspection system and perform required inspections in accordance with Contract Clause CONTRACTOR INSPECTION SYSTEM. Welding shall be subject to inspection to determine conformance with the requirements of AWS D1.1, the approved welding procedures and provisions stated in other sections of these specifications.

Nondestructive examination of designated welds will be required. Supplemental examination of any joint or coupon cut from any location in any joint may be required.

#### 2.3.3.1 Visual Examination



All visual examination of completed welds shall be cleaned and carefully examined for insufficient throat or leg sizes, cracks, undercutting, overlap, excessive convexity or reinforcement and other surface defects to ensure compliance with the requirements of AWS D1.1, Section 3 and Section 9, Part D.

#### 2.3.3.2 Nondestructive Examination

The nondestructive examination of shop and field welds shall be performed as designated or described in the sections of these specifications covering the particular items of work.

a. Testing Agency - The nondestructive examination of welds and the evaluation of examination tests as to the acceptability of the welds shall be performed by a testing agency adequately equipped and competent to perform such services or by the Contractor using suitable equipment and qualified personnel. In either case written approval of the examination procedures is required and the examination tests shall be made in the presence of the Contracting Officer. The evaluation of examination tests shall be subject to the approval and all records shall become the property of the Government.

b. Examination Procedures - Examination procedures shall conform to the following requirements.

(1) Ultrasonic Testing - Making, evaluating and reporting ultrasonic testing of welds shall conform to the requirements of AWS D1.1, Section 6, Part C. The ultrasonic equipment shall be capable of making a permanent record of the test indications. A record shall be made of each weld tested.

(2) Radiographic Testing - Making, evaluating and reporting radiographic testing of welds shall conform to the requirements of AWS D1.1, Section 6, Part B.

(3) Magnetic Particle Inspection - Magnetic particle inspection of welds shall conform to the applicable provisions of ASTM E 709.

(4) Dye Penetrant Inspection - Dye penetrant inspection of welds shall conform to the applicable provisions of ASTM E 165.

c. Acceptability of Welds - Welds shall be unacceptable if shown to have defects prohibited by AWS D1.1, Subsection 9.25 or possess any degree of incomplete fusion, inadequate penetration or undercutting.

d. Welds to be Subject to Nondestructive Examination

#### 2.3.3.3 Test Coupons

The Government reserves the right to require the Contractor to remove coupons from completed work when doubt as to soundness cannot be resolved by nondestructive examination. Should tests of any two coupons cut from the work of any welder show strengths less than that specified for the base

metal it will be considered evidence of negligence or incompetence and such welder shall be removed from the work. When coupons are removed from any part of a structure the members cut shall be repaired in a neat manner with joints of the proper type to develop the full strength of the members. Repaired joints shall be peened as approved or directed to relieve residual stress. The expense for removing and testing coupons, repairing cut members and the nondestructive examination of repairs shall be borne by the Government or the Contractor in accordance with the Contract Clauses INSPECTION AND ACCEPTANCE.

#### 2.3.3.4 Supplemental Examination

When the soundness of any weld is suspected of being deficient due to faulty welding or stresses that might occur during shipment or erection the Government reserves the right to perform nondestructive supplemental examinations before final acceptance. The cost of such inspection will be borne by the Government.

#### 2.3.4 Structural Steel Welding Repairs

Defective welds in the structural steel welding repairs shall be repaired in accordance with AWS D1.1, Subsection 3.7. Defective weld metal shall be removed to sound metal by use of air carbon-arc or oxygen gouging. Oxygen gouging shall not be used on ASTM A 514/A 514M steel. The surfaces shall be thoroughly cleaned before welding. Welds that have been repaired shall be retested by the same methods used in the original inspection. Except for the repair of members cut to remove test coupons and found to have acceptable welds costs of repairs and retesting shall be borne by the Contractor.

#### 2.3.5 Inspection of Steel Castings

The Contractor shall perform radiographic inspection of steel castings as designated and as described in the section of these specifications covering the particular item of work. The procedure for making, evaluating and reporting the radiographic inspection shall conform to the requirements of ASTM E 94.

The applicable referenced standards shall be as illustrated in ASTM E 446. The evaluation of the radiographs shall be subject to approval and all records shall become the property of the Government.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

All parts to be installed shall be thoroughly cleaned. Packing compounds, rust, dirt, grit and other foreign matter shall be removed. Holes and grooves for lubrication shall be cleaned. Enclosed chambers or passages shall be examined to make sure that they are free from damaging materials. Where units or items are shipped as assemblies they will be inspected prior to installation. Disassembly, cleaning and lubrication will not be required except where necessary to place the assembly in a clean and properly lubricated condition. Pipe wrenches, cold chisels or other tools

likely to cause damage to the surfaces of rods, nuts or other parts shall not be used for assembling and tightening parts. Bolts and screws shall be tightened firmly and uniformly but care shall be taken not to overstress the threads. When a half nut is used for locking a full nut the half nut shall be placed first and followed by the full nut. Threads of all bolts except high strength bolts, nuts and screws shall be lubricated with an approved lubricant before assembly. Threads of corrosion-resisting steel bolts and nuts shall be coated with an approved antigalling compound. Driving and drifting bolts or keys will not be permitted.

#### 3.1.1 Alignment and Setting

Each machinery or structural unit shall be accurately aligned by the use of steel shims or other approved methods so that no binding in any moving parts or distortion of any member occurs before it is fastened in place. The alignment of all parts with respect to each other shall be true within the respective tolerances required. Machines shall be set true to the elevations shown.

#### 3.1.2 Blocking and Wedges

All blocking and wedges used during installation for the support of parts to be grouted in foundations shall be removed before final grouting unless otherwise directed. Blocking and wedges left in the foundations with approval shall be of steel or iron.

#### 3.1.3 Foundations and Grouting

Concreting of subbases and frames and the final grouting under parts of machines shall be in accordance with the procedures as specified in Section 03301 CAST IN PLACE CONCRETE FOR CIVIL WORKS.

### 3.2 PROTECTION OF FINISHED WORK

#### 3.2.1 Machined Surfaces

Machined surfaces shall be thoroughly cleaned of foreign matter. All finished surfaces shall be protected by suitable means. Unassembled pins and bolts shall be oiled and wrapped with moisture resistant paper or protected by other approved means. Finished surfaces of ferrous metals to be in bolted contact shall be washed with an approved rust inhibitor and coated with an approved rust resisting compound for temporary protection during fabrication, shipping and storage periods. Finished surfaces of metals which shall be exposed after installation except corrosion resisting steel or nonferrous metals shall be painted as specified in Section 09965 PAINTING HYDRAULIC STRUCTURES AND APPURTENANT WORKS.

#### 3.2.2 Lubrication After Assembly

After assembly all lubricating systems shall be filled with the lubricant specified and additional lubricant shall be applied at intervals as required to maintain the equipment in satisfactory condition until acceptance of the work.

### 3.3 TESTS

#### 3.3.1 Workmanship

Workmanship shall be of the highest grade and in accordance with the best modern practices to conform with the specifications for the item of work being furnished.

#### 3.3.2 Production Welding

Production welding shall conform to the requirements of AWS D1.1 or AWS D1.2 as applicable. Studs on which pre-production testing is to be performed shall be welded in the same general position as required on production items (flat, vertical, overhead or sloping). Test and production stud welding will be subjected to visual examination or inspection. If the reduction of the length of studs becomes less than normal as they are welded, welding shall be stopped immediately and not resumed until the cause has been corrected.

-- End of Section --

## SECTION 05090A

WELDING, STRUCTURAL  
09/98

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC ASD Spec S335	(1989) Specification for Structural Steel Buildings - Allowable Stress Design, Plastic Design
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## AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ASNT RP SNT-TC-1A	(1996) Recommended Practice SNT-TC-1A
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## AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(1998) Standard Symbols for Welding, Brazing and Nondestructive Examination
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AWS A3.0	(1994) Standard Welding Terms and Definitions
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AWS D1.1	(1998) Structural Welding Code - Steel
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AWS Z49.1	(1999) Safety in Welding and Cutting and Allied Processes
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## 1.2 DEFINITIONS

Definitions of welding terms shall be in accordance with AWS A3.0.

## 1.3 GENERAL REQUIREMENTS

The design of welded connections shall conform to AISC ASD Spec S335 unless otherwise indicated or specified. Material with welds will not be accepted unless the welding is specified or indicated on the drawings or otherwise approved. Welding shall be as specified in this section, except where additional requirements are shown on the drawings or are specified in other sections. Welding shall not be started until welding procedures, inspectors, nondestructive testing personnel, welders, welding operators, and tackers have been qualified and the submittals approved by the Contracting Officer. Qualification testing shall be performed at or near

the work site. Each Contractor performing welding shall maintain records of the test results obtained in welding procedure, welder, welding operator, and tacker performance qualifications.

#### 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

##### SD-03 Product Data

Welding Procedure Qualifications; G  
Welder, Welding Operator, and Tacker Qualification; G  
Inspector Qualification; G  
Previous Qualifications; G  
Prequalified Procedures; G

Copies of the welding procedure specifications; the procedure qualification test records; and the welder, welding operator, or tacker qualification test records.

##### SD-06 Test Reports

Quality Control; G

A quality assurance plan and records of tests and inspections.

#### 1.5 WELDING PROCEDURE QUALIFICATIONS

Except for prequalified (per AWS D1.1) and previously qualified procedures, each Contractor performing welding shall record in detail and shall qualify the welding procedure specification for any welding procedure followed in the fabrication of weldments. Qualification of welding procedures shall conform to AWS D1.1 and to the specifications in this section. Copies of the welding procedure specification and the results of the procedure qualification test for each type of welding which requires procedure qualification shall be submitted for approval. Approval of any procedure, however, will not relieve the Contractor of the sole responsibility for producing a finished structure meeting all the requirements of these specifications. This information shall be submitted on the forms in Appendix E of AWS D1.1. Welding procedure specifications shall be individually identified and shall be referenced on the detail drawings and erection drawings, or shall be suitably keyed to the contract drawings. In case of conflict between this specification and AWS D1.1, this specification governs.

##### 1.5.1 Previous Qualifications

Welding procedures previously qualified by test may be accepted for this contract without requalification if the following conditions are met:

a. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.

b. The qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.

c. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

#### 1.5.2 Prequalified Procedures

Welding procedures which are considered prequalified as specified in AWS D1.1 will be accepted without further qualification. The Contractor shall submit for approval a listing or an annotated drawing to indicate the joints not prequalified. Procedure qualification shall be required for these joints.

#### 1.5.3 Retests

If welding procedure fails to meet the requirements of AWS D1.1, the procedure specification shall be revised and requalified, or at the Contractor's option, welding procedure may be retested in accordance with AWS D1.1. If the welding procedure is qualified through retesting, all test results, including those of test welds that failed to meet the requirements, shall be submitted with the welding procedure.

#### 1.6 WELDER, WELDING OPERATOR, AND TACKER QUALIFICATION

Each welder, welding operator, and tacker assigned to work on this contract shall be qualified in accordance with the applicable requirements of AWS D1.1 and as specified in this section. Welders, welding operators, and tackers who make acceptable procedure qualification test welds will be considered qualified for the welding procedure used.

##### 1.6.1 Previous Personnel Qualifications

At the discretion of the Contracting Officer, welders, welding operators, and tackers qualified by test within the previous 6 months may be accepted for this contract without requalification if all the following conditions are met:

a. Copies of the welding procedure specifications, the procedure qualification test records, and the welder, welding operator, and tacker qualification test records are submitted and approved in accordance with the specified requirements for detail drawings.

b. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.

c. The previously qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.

d. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

#### 1.6.2 Certificates

Before assigning any welder, welding operator, or tacker to work under this contract, the Contractor shall submit the names of the welders, welding operators, and tackers to be employed, and certification that each individual is qualified as specified. The certification shall state the type of welding and positions for which the welder, welding operator, or tacker is qualified, the code and procedure under which the individual is qualified, the date qualified, and the name of the firm and person certifying the qualification tests. The certification shall be kept on file, and 3 copies shall be furnished. The certification shall be kept current for the duration of the contract.

#### 1.6.3 Renewal of Qualification

Requalification of a welder or welding operator shall be required under any of the following conditions:

a. It has been more than 6 months since the welder or welding operator has used the specific welding process for which he is qualified.

b. There is specific reason to question the welder or welding operator's ability to make welds that meet the requirements of these specifications.

c. The welder or welding operator was qualified by an employer other than those firms performing work under this contract, and a qualification test has not been taken within the past 12 months. Records showing periods of employment, name of employer where welder, or welding operator, was last employed, and the process for which qualified shall be submitted as evidence of conformance.

d. A tacker who passes the qualification test shall be considered eligible to perform tack welding indefinitely in the positions and with the processes for which he is qualified, unless there is some specific reason to question the tacker's ability. In such a case, the tacker shall be required to pass the prescribed tack welding test.

#### 1.7 INSPECTOR QUALIFICATION

Inspector qualifications shall be in accordance with AWS D1.1. Nondestructive testing personnel shall be qualified in accordance with the requirements of ASNT RP SNT-TC-1A for Levels I or II in the applicable nondestructive testing method. The inspector may be supported by assistant welding inspectors who are not qualified to ASNT RP SNT-TC-1A, and assistant inspectors may perform specific inspection functions under the supervision of the qualified inspector.

#### 1.8 SYMBOLS



Symbols shall be in accordance with AWS A2.4, unless otherwise indicated.

## 1.9 SAFETY

Safety precautions during welding shall conform to AWS Z49.1.

## PART 2 PRODUCTS

### 2.1 WELDING EQUIPMENT AND MATERIALS

All welding equipment, electrodes, welding wire, and fluxes shall be capable of producing satisfactory welds when used by a qualified welder or welding operator performing qualified welding procedures. All welding equipment and materials shall comply with the applicable requirements of AWS D1.1.

## PART 3 EXECUTION

### 3.1 WELDING OPERATIONS

#### 3.1.1 Requirements

Workmanship and techniques for welded construction shall conform to the requirements of AWS D1.1 and AISC ASD Spec S335. When AWS D1.1 and the AISC ASD Spec S335 specification conflict, the requirements of AWS D1.1 shall govern.

#### 3.1.2 Identification

Welds shall be identified in one of the following ways:

a. Written records shall be submitted to indicate the location of welds made by each welder, welding operator, or tacker.

b. Each welder, welding operator, or tacker shall be assigned a number, letter, or symbol to identify welds made by that individual. The Contracting Officer may require welders, welding operators, and tackers to apply their symbol next to the weld by means of rubber stamp, felt-tipped marker with waterproof ink, or other methods that do not cause an indentation in the metal. For seam welds, the identification mark shall be adjacent to the weld at 3 foot intervals. Identification with die stamps or electric etchers shall not be allowed.

### 3.2 QUALITY CONTROL

Testing shall be done by an approved inspection or testing laboratory or technical consultant; or if approved, the Contractor's inspection and testing personnel may be used instead of the commercial inspection or testing laboratory or technical consultant. The Contractor shall perform visual and radiographic inspection to determine conformance with paragraph STANDARDS OF ACCEPTANCE. Procedures and techniques for inspection shall be in accordance with applicable requirements of AWS D1.1, except that in radiographic inspection only film types designated as "fine grain," or

"extra fine," shall be employed.

### 3.3 STANDARDS OF ACCEPTANCE

Dimensional tolerances for welded construction, details of welds, and quality of welds shall be in accordance with the applicable requirements of AWS D1.1 and the contract drawings. Nondestructive testing shall be by visual inspection, and radiographic and ultrasonic methods. The minimum extent of nondestructive testing shall be random, and under the direction of and subject to approval of, the Contracting Officer.

#### 3.3.1 Nondestructive Examination

The welding shall be subject to inspection and tests in the mill, shop, and field. Inspection and tests in the mill or shop will not relieve the Contractor of the responsibility to furnish weldments of satisfactory quality. When materials or workmanship do not conform to the specification requirements, the Government reserves the right to reject material or workmanship or both at any time before final acceptance of the structure containing the weldment.

#### 3.3.2 Destructive Tests

When metallographic specimens are removed from any part of a structure, the Contractor shall make repairs. The Contractor shall employ qualified welders or welding operators, and shall use the proper joints and welding procedures, including peening or heat treatment if required, to develop the full strength of the members and joints cut and to relieve residual stress.

### 3.4 GOVERNMENT INSPECTION AND TESTING

In addition to the inspection and tests performed by the Contractor for quality control, the Government will perform inspection and testing for acceptance to the extent determined by the Contracting Officer. The costs of such inspection and testing will be borne by the Contractor if unsatisfactory welds are discovered, or by the Government if the welds are satisfactory. The work may be performed by the Government's own forces or under a separate contract for inspection and testing. The Government reserves the right to perform supplemental nondestructive and destructive tests to determine compliance with paragraph STANDARDS OF ACCEPTANCE.

### 3.5 CORRECTIONS AND REPAIRS

When inspection or testing indicates defects in the weld joints, the welds shall be repaired using a qualified welder or welding operator as applicable. Corrections shall be in accordance with the requirements of AWS D1.1 and the specifications. Defects shall be repaired in accordance with the approved procedures. Defects discovered between passes shall be repaired before additional weld material is deposited. Wherever a defect is removed and repair by welding is not required, the affected area shall be blended into the surrounding surface to eliminate sharp notches, crevices, or corners. After a defect is thought to have been removed, and before rewelding, the area shall be examined by suitable methods to ensure that the defect has been eliminated. Repair welds shall meet the

inspection requirements for the original welds. Any indication of a defect shall be regarded as a defect, unless reevaluation by nondestructive methods or by surface conditioning shows that no unacceptable defect is present.

-- End of Section --

## SECTION 05481

## SLUICE GATES

Item No. 33a - 36" x 36" Motor Operated Sluice Gate  
Item No. 33b - 60" x 60" Motor Operated Sluice Gate  
Item No. 34a - 18" x 18" Hand Operated Sluice Gate  
Item No. 34b - 24" x 24" Hand Operated Sluice Gate

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B 16.1 (1989) Cast Iron Pipe Flanges and Flanged Fitting, Class 25, 125, 250, and 800

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36 (1991) Structural Steel  
ASTM A 48 (1992) Gray Iron Castings  
ASTM A 126 (1984) Gray Iron Castings for Valves, Flanges, and Pipe Fittings  
ASTM A 276 (1987) Stainless and Heat-Resisting Steel Bars and Shapes  
ASTM A 582 (1980) Free-Machining Stainless and Heat-Resisting Bars. Hot-Rolled or Cold-Finished  
ASTM B 21 (1983) Naval Brass Rod, Bar, and Shapes  
ASTM B 98 (1984) Copper-Silicon Alloy Rod, Bar, and Shapes  
ASTM B 124 (1987) Copper and Copper Alloy Forging Rod, Bar, and Shapes  
ASTM B 138 (1984) Manganese Bronze Rod, Bar, and Shapes  
ASTM B 139 (1983) Phosphor Bronze Rod, Bar, and Shapes

ASTM B 148	(1988) Aluminum-Bronze Castings
ASTM B 150	(1988) Aluminum-Bronze Rod, Bar, and Shape
ASTM B 584	(1988) Copper Alloy Sand Casting for General Applications
ASTM D 471	(1984) Test Method for Relative Density of Solid Pitch and Asphalt (Displacement Method)
ASTM D 1149	(1986) Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber (Flat Specimens)

## 1.2 GENERAL REQUIREMENTS

### 1.2.1 Standard Products

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site. Gates shall be the product of one manufacture.

### 1.2.2 Nameplates

Each major item of equipment shall have the manufacturer's name, address, type or style, model, serial number, and catalog number on a plate secured to the item of equipment. Nameplate for each electric motor shall show the horsepower, speed in revolutions per minute, full load current, voltage, frequency, phase, time rating, maximum ambient temperature, insulation class code letter, and service factor.

### 1.2.3 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field and shall advise the Contracting Officer of any discrepancy before performing the work.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation. The

following shall be submitted in accordance with Section 01330 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Manufacturer's descriptive data and technical literature, catalog cuts, and installation instructions; G.

Spare parts data for each different item of material and equipment specified, after approval of the detail drawings and not later than two months prior to the date of beneficial occupancy. Data shall include a complete list of parts and supplies, with current prices and source of supply, and a list of the parts recommended by the manufacturer to be replaced after 1 and 3 year(s) of service.

SD-04 Drawings

Sluice Gates and Electric Gate Actuators; G

Detail drawings consisting of a complete list of equipment and materials. Detail drawings containing complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

SD-06 Instructions

Sluice Gates and Electric Gate Actuators; G

Proposed diagrams, instructions, and other sheets, prior to posting.

SD-09 Reports

Testing

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall indicate the final position of controls.

SD-19 Operation and Maintenance Manuals

Sluice Gates and Electric Gate Actuators; G

Six complete copies of operating manual outlining the step-by-step procedures required for system startup, operation and shutdown. The manual shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Six complete copies of maintenance manual listing routine

maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals shall include simplified wiring, layout, and control diagrams of the system as installed.

#### 1.4 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be stored with protection from the weather, humidity, and temperature variations, dirt and dust, or other contaminants. Gates shall be complete when shipped and the manufacturer shall use all due and customary care in preparing them for shipment to avoid damage in handling or in transit. Particular care shall be taken to see that the parts are completely closed and locked in position before shipment. Parts that are to be embedded in concrete may be shipped separately. Gates of 24 inches and larger shall be bolted securely or otherwise fastened to skids in such a manner that they may be safely handled.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

##### 2.1.1 Physical and Chemical Properties

The requirements of ANSI, ASTM, or other standards to which reference is made elsewhere in this text shall govern the physical and chemical characteristics of the gate components.

##### 2.1.2 Tests

Whenever gate components are to be made in conformance with ANSI, ASTM, or other standards that include test requirements or testing procedures, such requirements or procedures shall be met by the sluice gate manufacturer. The records of such tests shall be made available to the Contracting Officer.

#### 2.2 Sluice Gates

Sluice gates shall be of the sizes indicated and shall conform to the requirements specified. For sluice gates the Contractor may provide either cast iron or reinforced plastic gates as specified.

##### 2.2.1 Sluice Gate: Thimble, Frame, Guides, and Slide

###### 2.2.1.1 Cast Iron Sluice Gates

Cast-iron, ASTM A 126, Class 30.

#### 2.2.1.2 Reinforced Plastic Sluice Gates

Carbon steel or stainless steel frame, reinforced plastic slide as specified in Part 3.

#### 2.2.2 Pedestal and Gear Housing

Cast-iron, ASTM A 126, Class B or ASTM A 48, Class 30.

#### 2.2.3 Gears

Bronze, ASTM B 148 or ASTM B 584; or steel, AISI 8620 OR 4140.

#### 2.2.4 Bearings

Bronze, ASTM B 148 or ASTM B 150.

#### 2.2.5 Wedges, Thrust Nut, Stem Couplings, and Gate-Activator Lift Nut

Bronze, ASTM B 584.

#### 2.2.6 Sluice Gate: Seating Faces

##### 2.2.6.1 Cast Iron Sluice Gate

Bronze, ASTM B 21, Alloys A or B, ASTM B 138, ASTM B 98, or ASTM B 139.

##### 2.2.6.2 Reinforced Plastic Sluice Gate

Ultra high molecular weight polyolifin.

#### 2.2.7 Stems, Stem Guide, and Guide Liner.

Stainless Steel, ASTM A 582, type 303 or ASTM A 276, type 304.

#### 2.2.8 Fasteners

Bronze, ASTM B 98 or Stainless Steel, ASTM A 276, type 304 or ASTM A 582,



type 303.

#### 2.2.9 Sluice Gate, Flush-Bottom Seal

Elastomeric materials, ASTM D 2000.

#### 2.2.10 Sluice Gate, Flush-Bottom Retainer Bar

Cast-iron, ASTM A 126; Stainless Steel, ASTM A 276, type 302 or 304, or ASTM A 582 type 303; Bronze, ASTM B 98, ASTM B 150, or ASTM B 138.

#### 2.2.11 Electrical Work

The motor-operated sluice gate shall include (as one integral component) but not limited to, the electric motor, reduction gearing, drive bushing or top entry stem nut, torque switches, position limit switches, gear case and auxiliary handwheel.

##### 2.2.11.1 Motor

The electric motor-operated sluice gates shall be designed for sluice gate service and shall be totally enclosed, non-ventilated. As a minimum, the electric motor enclosure shall meet NEMA 4 weatherproof construction. Motor shall be capable of operating through one complete cycle, open-close-open or close-open-close, under the maximum specified operating condition when voltage to the motor is +/-10 percent of the specified voltage. Motors shall have Class F insulation with Class B temperature rise. Overload protection shall be by means of inherent motor thermal sensors embedded in the windings. Operator shall have a declutch lever and handwheel for manual operation.

##### 2.2.11.2 Limit Switches

Open and close limit switches shall be geared to the drive mechanism, and in step at all times, whether the unit is operated electrically or mechanically. The switches shall be of the rotary drum wiping action contact type, field adjustable. Limit switch contacts shall be solid silver and have a minimum rating of 10A (break) inductive at 120 VAC. The drive mechanism shall be totally enclosed. Gears shall be steel.

##### 2.2.11.3 Torque Switches

The operating mechanism shall include an adjustable torque limit switch arrangement to break the control power circuit when the gate reaches the open or closed position, or an obstruction has been encountered in either direction of travel.

##### 2.2.11.4 Electrical Controles

The electrical controls shall include but not be limited to:

- a. Motor protector
- b. Motor starter
- c. Control power transformer 120V single-phase where required
- d. Reversing controller
- e. Open-stop-close push buttons in NEMA 4 weatherproof enclosure
- f. Indication lights, red for open, green for close
- g. Thermostat-controlled space heater to prevent condensation

#### 2.2.11.5 Handwheel

Gate lifts shall be handwheel or geared crank type for manual operation. Lifts shall operate the gate with a maximum pull of 40 lb on the handwheel or crank. The unit shall be connected in such a way that operation by motor shall not cause the handwheel to rotate, and operation by handwheel shall not cause the motor to rotate. The handwheel shall have an arrow and the word "Open" indicating required rotation. The handwheel shall operate in the clockwise direction to close.

#### 2.2.11.6 Enclosure

All electrical controls, limit, torque switches and all electrical accessories shall be housed in a single enclosure meeting NEMA 4 weatherproof construction. The enclosure shall have a lockable door.

### PART 3 EXECUTION

#### 3.1 GENERAL REQUIREMENTS: SLUICE GATE

##### 3.1.1 Frames

##### 3.1.1.1 Cast Iron Sluice Gate

The frame shall be of cast-iron. It shall be of ample section and cast in one piece. The frame shall be designed for the maximum head indicated with a minimum safety factor of five with regard to tensile, compressive, and shear strength. All surfaces forming joints or bearings shall be machined.

The frame shall be flat back type and shall be machined on the rear face to bolt directly to the machined face of the wall thimble. The frame shall be of cast-iron. It shall be of ample section and cast in one piece. The frame shall be designed for the maximum head indicated with a minimum safety factor of five with regard to tensile, compressive, and shear strength. All surfaces forming joints or bearings shall be machined.

The frame shall be flat back type and shall be machined on the rear face to bolt directly to the machined face of the wall thimble.

### 3.1.1.2 Reinforced Plastic Sluice Gate

Carbon steel, flame zinc sprayed (4 to 6 mils) and epoxy coated (minimum 4 mils DFT) or 316L stainless steel.

### 3.1.2 Slides

#### 3.1.2.1 Cast Iron Sluice Gates

The slide shall be made of cast-iron, with strengthening ribs where required, and a reinforced section to receive the seating faces. The slide shall be designed for the maximum head indicated with a minimum safety factor of five with regard to tensile, compressive, and shear strength. The slide shall have tongues on each side extending its full length, and the tongues shall be machined accurately on contact surfaces. Surfaces of the slide that come into contact with the seat facings and wedges shall be machined accurately. The maximum allowable clearance between the slide and the slide guide shall be 1/16 inch. A thrust-nut pocket shall be provided above the horizontal centerline of the slide reinforced by ribs. The thrust-nut pocket shall be drained.

#### 3.1.2.2 Reinforced Plastic Sluice Gates

Slide (disc) shall be constructed from a reinforced rigid composite plastic material, having a minimum thickness of 1/8 inch. Slide (disc) shall have internal matrix of carbon steel of suitable strength for the specified service. The slide (disc) outer surface skins shall be a homogeneous plastic material having extremely high tensile and impact strength, be nontoxic and shall be stabilized against ultraviolet light. The plastic material shall be an Aramid fiber from the Kevlar family of fibers, and have the following minimum properties:

#### Properties Table

Tensile Strength	12,500 psi
Young's Modulus	1,200,000 psi
Flexural Strength	18,000 psi
Flexural Modulus	1,400,000 psi
Compressive Strength	11,000 psi
Impact Strength	40.3 x 1,000,000 erg
Water Absorption	0.38%
Specific Gravity	1.72
Coefficient of Thermal Expansion	0.000016 per C
Heat Distortion Point	80 degrees C ASTM D648
Low Temperature Impact Strength	93% @-20C
Notch Sensitivity	Not notch sensitive
Weathering Properties	Excellent

Fire Resistance	Class 1 spread of flame, Rating BS476: Part 1: 1953 self-extinguishing, ASTM D 635 - 56R
Chemical Resistance	Organics, Alkalines, Ozone (2 to 3 PPM)

Rigid polyurethane foam shall be used as filler between the steel grid reinforcing system and shall be a minimum of 7 lb density per cubic foot. The gate shall be designed to limit the deflection to a maximum of 1/1000 of the span under design head conditions based upon horizontal support members only. The Contractor shall submit drawings and comprehensive design criteria from manufacturer to substantiate that the required deflection figure for each door has been achieved. Comprehensive safety factor calculations shall include bending moments, buckling stress, bonding stress with thermal expansion factors suitable for referenced in NASA CR-1457, "Manual for Plates and Shells", et. al. Safety factors shall be calculated for the disc under maximum head, and shear at the disc/seal interface.

#### 3.1.3 Seating Faces for Cast Iron Sluice Gates

Seating faces shall be made of strips of rolled or extruded bronze. They shall be secured firmly in finished grooves in the frame and slide faces in such a way as to ensure that they will remain in place, free from distortion and loosening during the life of the sluice gate. The faces shall be of ample section and so finished that the maximum clearance between the seating surfaces, with the slide in the closed position, shall be 0.004 inches.

#### 3.1.4 Seals

Text

##### 3.1.4.1 Cast Iron Sluice Gates

Resilient seals for flush-bottom gates shall be of natural or synthetic rubber. Reclaimed rubber shall not be used. Rubber compounds shall contain not more than 1.5 parts of wax per 100 parts of rubber hydrocarbon.

Rubber compounds shall be free of vegetable oils, vegetable-oil derivatives, animal fats, and animal oils. Rubber seals shall be resistant to microbiological attack, copper poisoning, and ozone attack. The design of the seal shall be such as to provide for the minimum leakage as specified. Seals shall be mounted on the slide or the frame and shall be held securely in place with a retainer bar bolted to the frame or slide leaving an unobstructed flush invert.

##### 3.1.4.2 Reinforced Plastic Sluice Gate#1 Sub Title

The sealing arrangement for the reinforced plastic sluice gates shall comprise of sealing faces and side guides constructed of ultra high molecular weight polyolifin having an extremely low coefficient of friction and backing constructed of highly resilient expanded neoprene. Guides and seating of the gate shall be easily adjustable (minimum 5/8 inches). All moving contact surfaces shall be incompatible to each other thereby minimizing sticking/jamming and making the operation easy. Leakage rates shall be 1/2 as allowed by AWWA C501.

#### 3.1.4.3 Material Tests

Rubber compounds shall be capable of withstanding an ozone resistance test when tested in accordance with ASTM D 1149. The tests shall be conducted on an unstressed sample for 70 hours at 104 degrees F without visible cracking in the surfaces of the test samples after the tests. Rubber compounds shall have less than 2 percent volume increases when tested in accordance with ASTM D 471 after being immersed in distilled water at 73.4 degrees F, plus or minus 2 degrees F for 70 hours.

#### 3.1.5 Guides

Guides shall be made of cast-iron and bolted to the frame or cast integrally with it and shall be machined on all bearing and contact faces. Guides shall be designed for the maximum head indicated with a safety factor of 5 for shear, compression, and tension. The guides shall be of such length as to support at least one half the vertical height of the slide when in the open position. Provision shall be made to prevent lateral movement of bolted-on guides. They shall be capable of taking the entire thrust produced by water pressure and wedging action with a safety factor of 5. Wedges or wedge facings shall be attached securely to the guides at points where, in the closed position, they will make full contact with the wedging surfaces on the slide.

#### 3.1.6 Thrust Nut#1 Sub Title

Each gate shall be provided with a thrust nut for connecting the stem to the slide. It shall be of ample design to endure the thrust developed during gate operation under the maximum operating head condition loads with a safety factor of 5, in opening and closing direction. The thrust nut and slide shall be constructed to prevent turning of the thrust nut in the pocket in the slide. On rising-stem gates, the thrust nut shall be threaded and keyed or threaded and pinned to the stem.

#### 3.1.7 Wedging Devices

All sluice gates shall be equipped with adjustable side-wedging devices to provide contact between the slide and frame facings when the gate is in closed position. All faces shall be machined accurately and so designed

that they will remain in the fixed position after adjustment. On all gates larger than 24 inches that will be subjected to unseating heads, top and bottom wedging devices shall be provided. If the gates are flush-bottom closure gates, they will be provided with top wedges only.

#### 3.1.8 Assembly Bolts, Studs, Nuts

All assembly bolts, studs, nuts, and anchor bolts shall be of such size and spacing as required to provide for the design forces with a safety factor of 5. For gates mounting to thimbles, an adequate number of holes shall be provided in the flange on the back of the gate to prevent leakage under the design heads and to resist the shearing action caused by closing and opening forces.

#### 3.1.9 Wall Thimbles

Wall thimbles shall be made of cast-iron and shall be furnished by the gate manufacturer. The wall thimble shall provide a rigid mounting, designed to prevent warping of the gate frame during installation. The cross section of the thimble shall have the shape of the letter "F". The front, or mounting flange, shall be machined and shall be drilled and tapped to the same template used for its particular gate frame. A ring shall be cast on the periphery of the wall thimble to form a water stop and anchor ring in the concrete. The gate shall be attached to the wall thimble with bolts or studs as specified. To permit entrapped air to escape as the thimble is being encased in concrete, holes shall be cast or drilled in each entrapment zone formed by the reinforcing ribs or the flange and water stops. The holes shall be 1 1/2 inches in diameter and no more than 2 feet apart. Wall thimbles will be required for cast iron sluice gates. For reinforced plastic sluice gates, mounting will be as recommended by the gate manufacturer.

### 3.2 GENERAL REQUIREMENTS: SLUICE GATES

#### 3.2.1 Stems and Stem Couplings

The operating stem shall be designed for a tensile strength to withstand a 200-lb effort on the crank or a 250-ft-lb effort on a wrench nut and shall be designed for a critical buckling compressive load assuming an 80-lb effort on the crank, or a 100-ft-lb torque on a wrench nut. The critical buckling load shall be determined by using the Euler Column Formula, using  $C=2$ . Where electric-motor-driven lifts are used, the stem design force shall not be less than 1.25 times the output thrust of the unit in the stalled motor condition. The threads of the stem shall be machine cut or rolled and of the square or acme type. The number of threads per inch shall be such as to work most effectively with the lift mechanism used. Where stems are furnished in more than one place, the different sections shall be joined by solid couplings. The couplings shall be threaded and

keyed or threaded and bolted, and shall be of greater strength than the stem.

#### 3.2.2 Stem Guides

Bracket stem guides (including both the guide housing and the bracket) shall be constructed so that when properly spaced they will hold the stem in alignment and yet allow it enough play to permit easy operation. The inside diameter of the guide shall not be greater than 1/8 inch larger than the outside diameter of the stem. The guides shall be spaced in accordance with the manufacturer's recommendations for each stem size. The l/r ratio shall not be greater than 200. The guides shall be adjustable with regard to the bracket to provide proper concentric alignment with the stem and shall be designed so that alignment will be maintained after adjustment. The guides shall be lined and provisions shall be made to hold the lining in place. Brackets shall be attached to the wall by sufficient anchor bolts to prevent twisting or sagging under load.

#### 3.2.3 Electric Lifting Devices

The operating unit for the motor-operated lift mechanism shall include, but not be limited to, the electric motor, reduction gearing, stem nut, pedestal, torque and limit switches, reversing magnetic starter, pushbutton control, indicator lights, shop wiring, gear case, and crank for operation in case of power failure. The crank shall be removable and fitted with a corrosion resistant rotation handle. The maximum crank radius shall be 15 inches.

#### 3.2.4 Gear Case

The gear case shall be of cast-iron. Flanges for motor attachment and pedestal attachment shall be integrally cast, fully machined, and template drilled. Bearing and grease seal seats shall be machined using jigs and fixtures to ensure proper positioning of the parts in the assembled unit. Other surfaces requiring precision fit shall be machined or jig drilled, or both.

#### 3.2.5 Pedestal

The pedestal shall be of sufficient section to withstand the full load encountered in the gate operation, maintaining a structural safety factor of 5 with regard to tension, compression, or shear.

#### 3.2.6 Gears

The reduction gearing shall consist of helical gears, spur gears, or worm gears of the proper ratio for transferring the full torque of the motor to the stem nut and for operating the gate against the operating head. Helical

and spur gears shall be of alloy steel accurately machined. Torque requirements shall be computed on the basis of an efficiency of not greater than 50 percent. Worm gears shall be made of bronze.

#### 3.2.7 Bearings

Roller bearings shall be provided on the stem nut to endure the thrust developed during opening and closing of the gate. All other gears and shafting shall be mounted on antifriction bearings throughout.

#### 3.2.8 Stem Nut

The stem nut shall engage the threads of the stem and shall be rotated by power to raise or lower the gate. The stem nut shall be of two-piece construction to permit installation and removal without complete disassembly of the lifting device.

#### 3.2.9 Rate of Operation

All parts of the lift mechanism shall be designed to move the gate slide at a rate of approximately 12 inches/min (minimum) under the specified operating head condition.

#### 3.2.10 Electric Motor

Motors shall be high torque with sufficient power to operate the gate through one complete cycle: open-close-open or close-open-close, under the specified operating head when voltage to motor terminals is within 10 percent of specified voltage. The motors shall be totally enclosed, nonventilated, and wired for the specified current characteristics. They shall be capable of a running torque equal to 40 percent of the maximum motor torque required without exceeding a temperature rise of 167 degrees F over an ambient temperature of 104 degrees F.

#### 3.2.11 Torque Protection

The operating unit shall include an adjustable torque or thrust-limited switch capable of stopping the power to the motor when the gate has reached the stops in the open or closed position or when an obstruction has been encountered in either direction of travel. Torque switches shall be factory-set to satisfy the calculated value corresponding to the maximum operating conditions, and detailed instructions shall be furnished to the purchaser for final setting after installation.

#### 3.2.12 Limit Switches

Limit switches shall be geared to the drive mechanism and in step at all times, whether the unit is operating electrically or manually. The switches



shall be capable of being set to trip at the fully open and fully closed gate positions or at any point between. All electrical interconnections between limit switches, torque switches, indicator lights, and so forth, shall be factory-wired and ready for operation. All gearing used in connection with limit switches shall be factory-lubricated.

#### 3.2.13 Lubrication

All gearing and bearings shall be grease or oil lubricated to permit year-round operation in temperature ranging from -20 degrees F through 140 degrees F. Oil or grease seals shall be provided above and below the bearing on the stem nut and on other exterior openings in the gear case where grease or oil can escape.

#### 3.2.14 Handcrank

The operating unit shall be equipped with a handcrank for manual operations. The crank shall be connected so that operation of the motor will not cause the crank to rotate and the operation of the crank shall not cause the motor rotor to rotate. The crank shall be engaged by an exterior lever or an automatic clutch. The action of the lever shall also declutch the motor if there is no device to accomplish this automatically when the power supply to the motor ceases. Should the power return to the motor while the crank is in use, the design of the unit shall prevent the power from being transmitted to the crank. The crank shall require an effort of no more than 50 ft-lbs to lift the gate after the slide is unseated from its wedges under the maximum specified unblanced head. An arrow and the word "open" or "closed" shall be placed on the crank to indicate direction or resultant gate movement. The crank shall be removable and fitted with a corrosion resistant rotating handle. The crank radius shall be 15 inches.

#### 3.2.15 Hammer Flow

The operating unit shall include a built-in lost motion device that will permit the motor to attain full speed before providing the hammer blow necessary to initiate gate motion in either opening or closing of the gate.

#### 3.2.16 Electrical Control Enclosure

All controls shall be mounted in an enclosure to be located in an Electrical Panel. The cover shall be secured by adequate fasteners and a gasket shall be provided. "Open", "stop", and "close" indicator lights shall be located on the cover. Red and green lights shall also be provided to indicate gate positions: red for open and green for closed. Both lights shall remain on when the gate is in intermediate position between closed and open. All controls including those specified in this section, together with limit switches, torque switches, and appurtenances, shall be factory-wired. (See other sections for complete operating requirements and interfaces for the system).

### 3.2.17 Stem Cover

Each unit shall be provided with a stem cover.

### 3.2.18 Indicator

Each unit shall be provided with a dial position indicator to show the following gate positions: fully closed, quarter open, half open, three-quarter open, and fully open. The indicator shall be connected at all times regardless of manual or power operation. The assembly shall be totally enclosed.

## 3.3 INSTALLATION

### 3.3.1 Hole Protection

Tapped holes in thimbles shall be plugged for protection during concrete pouring and setting.

### 3.3.2 Surface Protection

During construction, the surfaces of the thimble and gate shall be covered or otherwise protected from concrete spillage, paint, oil, and debris. Any damage that occurs to the thimble or gate in storage or handling shall be corrected prior to installation of the gate or operation and testing of the gate.

### 3.3.3 Thimble

Thimbles shall be positioned accurately and supported to prevent shifting during the pouring of the surrounding concrete. Thimbles shall be carefully braced both horizontally and vertically to prevent distortion. Concrete shall be poured carefully to provide a good bond to the thimble without voids. Grout shall be forced into the air vent holes.

### 3.3.4 Switch Setting

After installation of gates with motor-operated lift mechanisms, torque switches shall be adjusted and limit switches set in accordance with the manufacturer's recommendations. The gate shall then be operated through one complete cycle, open-closed-open or close-open-close.

## 3.4 FIELD LEAKAGE TEST

A field leakage test shall be performed after installation of the gates. The manufacturer shall be notified of the test in sufficient time to enable him to have a representative present at the test site. After all adjustments have been made and the mechanisms properly lubricated, each gate slide shall be operated through one complete cycle as a final check for proper operation before starting the leakage test. Seating and unseating heads shall be measured from the top surface of the water to the center of the gate.

#### 3.4.1 Seating Head

Under the design seating head of 20 feet, the leakage shall not exceed 0.1 gpm per foot of seating perimeter.

#### 3.4.2 Unseating Head

Under the design unseating head of 20 feet, the leakage shall not exceed 0.2 gpm per foot of seating perimeter.

### 3.5 PAINTING AND FINISHING

Unless otherwise specified all exposed ferrous metal not factory finished shall be painted as specified in Section 09900 PAINTING, GENERAL. No factory finished equipment or appurtenances shall be painted except that damage factory finishes shall be retouched in accordance with manufacturer requirements and with paint obtained from the manufacturer. Nameplates shall not be covered with paint but shall be cleaned and legible at completion of the work. Stainless steel and bronze surfaces shall not be painted.

-- End of Section --

## SECTION 05490

## AUTOMATIC DRAINAGE GATES AND ELASTOMERIC CHECK VALVES

## Item No. 36 - Elastomeric Check Valve

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 126 (1993) Gray Iron Castings for Valves,  
Flanges, and Pipe Fittings

## 1.2 SUBMITTALS

Government approval is required for all submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-01 Data

Descriptive Data and Technical Literatures; G.

Manufacturer's descriptive data and technical literature, catalog cuts, installation instructions, and operation and maintenance manual.

## SD-04 Drawings

Detail Drawings for Automatic Drainage Gates and Elastomeric Check Valves; G.

Detail drawings consisting of a complete list of equipment and materials. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

## 1.3 QUALIFICATIONS

## 1.3.1 Manufacturers

The manufacturers shall have at least five (5) years experience in the manufacturer of the product being supplied under this specification, and shall provide references and a list of installation upon request.

## 1.3.2 Manufacturer's Representative

Manufacturer's authorized representative, who is experienced in the installation, operation and maintenance of the product, shall be provided. The representative will assist in the installation and train Somerset County personnel in the operation, maintenance, and trouble-shooting of the product.

## PART 2 PRODUCTS

### 2.1 AUTOMATIC DRAINAGE GATES (NOT USED)

### 2.2 ELASTOMERIC CHECK VALVES

Check valves are to be all rubber of the flow operated check type with a slip-on connection. The check valve is designed to slip over the pipe outside diameter and attached by means of vendor furnished stainless steel clamps. The port area shall contour down to a duckbill which shall allow passage of flow in one direction while preventing reverse flow. The valve shall be one piece rubber construction with nylon reinforcement. In sizes 20" and larger, the bill portion shall be thinner and more flexible than the valve body, and formed into a curve of 180 degrees. Manufacturer must have available flow test data from an accredited hydraulic laboratory to confirm pressure drop data. Company name, plant location, valve size and serial number shall be bonded to the check valve.

## PART 3 EXECUTION

### 3.1 INSTALLATION

The elastomeric check valves shall be installed in accordance with the manufacturer's written installation and operations manual and approved submittals.

### 3.2 PAINTING AND FINISHING

Unless otherwise specified, all exposed ferrous metal not factory finished shall be painted as specified in Section 09900 PAINTING, GENERAL. No factory finished equipment or appurtenance shall be painted except that damaged factory finishes shall be retouched in an acceptable manner with paint obtained from the manufacturer. Nameplates shall not be covered with paint but shall be cleaned and legible at completion of the work.

-- End of Section --

## SECTION 05500

MISCELLANEOUS METAL  
07/97

Item No. 19 - Steel Channel 6 x 10.5  
Item No. 20 - Modified Steel Channel 8 x 21.4  
Item No. 22 - Miscellaneous Steel

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A14.3 (1992) Ladders - Fixed - Safety Requirements

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36 (1996) Carbon Structural Steel

ASTM A 53 (1996) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 123 (1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 283 (1993a) Low and Intermediate Tensile Strength Carbon Steel Plates

ASTM A 500 (1993) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM A 653 (1996) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A 924 (1996a) Steel Sheet, Metallic-Coated by the Hot-Dip Process

ASTM B 221 (1996) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

ASTM F 1267 (1991) Metal, Expanded, Steel

## AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (1995) Minimum Design Loads for Buildings  
and Other Structures

## AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (1994) Structural Welding Code - Steel

## NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM MBG 531 (1993) Metal Bar Grating Manual

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-04 Drawings

Miscellaneous Metal Items; G.

Detail drawings indicating material thickness, type, grade, and class; dimensions; and construction details. Drawings shall include catalog cuts, erection details, manufacturer's descriptive data and installation instructions, and templates. Detail drawings for the following items: safety cages, bar screens, steel stairs.

## SD-14 Samples

Miscellaneous Metal Items; G.

Samples shall be full size, taken from manufacturer's stock, and shall be complete as required for installation in the structure. Samples may be installed in the work, provided each sample is clearly identified and its location recorded.

## 1.3 WORKMANSHIP

Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall

be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

#### 1.4 ANCHORAGE

Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; and lag bolts and screws for wood.

#### 1.5 SHOP PAINTING

Surfaces of ferrous metal except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating unless otherwise specified. Surfaces of items to be embedded in concrete shall not be painted. Items to be finish painted shall be prepared according to manufacturer's recommendations or as specified.

### PART 2 PRODUCTS

#### 2.1 PIPE GUARD RAILS

Pipe guard rails shall be heavy duty steel pipe conforming to ASTM A 53, Type E or S, weight STD, black finish.

#### 2.2 EXPANSION JOINT COVERS

Expansion joint covers shall be constructed of extruded aluminum with standard mill finish for floor covers and exterior covers. Plates, backup angles, expansion filler strip and anchors shall be designed as indicated.

#### 2.3 PIPERAILS

Handrails shall be designed to resist a concentrated load of 200 pounds in any direction at any point of the top of the rail or 20 pounds per foot applied horizontally to top of the rail, whichever is more severe.

##### 2.3.1 Steel Piperails, Including Carbon Steel Inserts

Steel handrails, including inserts in concrete, shall be steel pipe conforming to ASTM A 53 or structural tubing conforming to ASTM A 500, Grade A or B of equivalent strength. Steel railings shall be 2 inch



nominal size. Railings shall be hot-dip galvanized and shop painted. Pipe collars shall be hot-dip galvanized steel.

- a. Joint posts, rail, and corners shall be fabricated by one of the following methods:

- (1) Mitered and welded joints by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Railing splices shall be butted and reinforced by a tight fitting interior sleeve not less than 6 inches long.

## 2.4 LADDERS

Ladders shall be galvanized steel or aluminum, fixed rail type in accordance with ANSI A14.3.

## 2.5 MISCELLANEOUS

Miscellaneous plates and shapes for items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings, and frames, shall be provided to complete the work.

## 2.6 STEEL STAIRS

Steel stairs shall be complete with structural or formed channel stringers, grating treads, handrails, and necessary bolts and other fastenings as indicated. Structural steel shall conform to ASTM A 36. Stairs and accessories shall be galvanized. Grating treads shall have slip-resistant nosings.

## 2.7 TRASH RACKS, BAR SCREENS, AND RAKE (SAFETY CAGES)

Trash racks and bar screens, complete with spacers, rake and anchor straps, shall be fabricated and shall be installed at the inlet structures as indicated. Bars, holders, spacers and strap anchors shall be of corrosion-resistant steel. Trash rack rake shall be constructed in accordance with detail on drawings.

# PART 3 EXECUTION

## 3.1 GENERAL INSTALLATION REQUIREMENTS

All items shall be installed at the locations shown and according to the

manufacturer's recommendations. Items listed below require additional procedures as specified.

### 3.2 INSTALLATION OF PIPE GUARDRAILS

Pipe guardrails shall be set vertically in concrete piers. Piers shall be constructed of, and the hollow cores of the pipe filled with, concrete specified in SECTION 03300 CAST-IN-PLACE STRUCTURAL CONCRETE, having a compressive strength of 3000 psi.

### 3.3 ATTACHMENT OF PIPERAILS

Toeboards and brackets shall be installed where indicated. Splices, where required, shall be made at expansion joints. Removable sections shall be installed as indicated.

#### 3.3.1 Installation of Steel Piperails

Installation shall be in pipe sleeves embedded in concrete and filled with molten lead or sulphur. Installation for stair shall be base plates bolted to stringers or structural steel framework.

### 3.4 INSTALLATION OF TRASH RACKS AND BAR SCREENS

Spacers shall be set and maintained accurately in position at the time concrete is placed. Units shall be installed and adjusted where required to prevent binding in the spacers. After the units have been installed, they may be inspected and tested for operation in the field throughout the entire length of travel. Any defects found due to faulty construction shall be required at the expense of the Contractor.

-- End of Section --

## SECTION 05502

METALS: MISCELLANEOUS, STANDARD ARTICLES, SHOP FABRICATED ITEMS  
05/92

## PART 1 GENERAL

## 1.1 REFERENCE

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1996) Carbon Structural Steel
ASTM A 53	(1996) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 123	(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 276	(1996) Stainless and Heat-Resisting Steel Bars and Shapes
ASTM A 307	(1994) Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength
ASTM A 325	(1996) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 500	(1993) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 501	(1993) Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

## 1.2 SUBMITTALS

Government approval is required for all submittals with a "G" designation. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Shop Fabricated Metal Items; G.

Detail drawings shall be submitted for approval as specified and in Section 05101 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

## SD-07 Schedules

Miscellaneous Metals and Standard Metal Articles; G. Shop Fabricated Metal Items; G.

Lists of materials shall be submitted for approval as specified and in Section 05101 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

## SD-09 Reports

Miscellaneous Metals and Standard Metal Articles; G. Shop Fabricated Metal Items; G.

Certified test reports for materials tests and analyses shall be submitted for approval as specified and in Section 05101 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

## SD-14 Samples

Miscellaneous Metals and Standard Metal Articles; G. Shop Fabricated Metal Items; G.

Samples shall be submitted for approval as specified and in Section 05101 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS. Samples of standard or fabricated items shall be full size and complete as required for installation in the work, and may be installed in the work, provided each sample is clearly identified and its location recorded.

## SD-18 Records

Miscellaneous Metals and Standard Metal Articles; G. Shop Fabricated Metal Items; G.

Records which identify the disposition of approved material and fabricated items in the work must be submitted for approval as specified and in Section 05101 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

## 1.3 FABRICATION AND WORKMANSHIP REQUIREMENTS

Fabrication requirements and workmanship provisions for items specified in this section shall conform with the requirements of Section 05101 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

## PART 2 PRODUCTS

## 2.1 MISCELLANEOUS METALS AND STANDARD METAL ARTICLES

Miscellaneous metal materials and standard metal articles shall conform to the respective specifications and other designated requirements. Sizes shall be as specified or shown. Where material requirements are not specified, materials furnished shall be suitable for the intended use and shall be subject to approval.

## 2.1.1 Structural Steel

## ASTM A 36

## 2.1.2 Steel Tubing

## 2.1.2.1 Structural

## ASTM A 500, Grade B

## 2.1.3 Steel Pipes and Pipe Fittings

## 2.1.3.1 Pipes

ASTM A 53, Type S, Grade A, seamless or electric resistance welded nominal size and weight class or outside diameter and nominal wall thickness as shown.

## 2.1.4 Stainless Steel

## 2.1.4.1 Plate, Sheet, and Strip

ASTM A 240, UNS S30400, S40500 or S41008. Plate finish shall be hot-rolled and annealed or heat treated, and blast cleaned or pickled. Sheet and strip finish shall be No. 1.

## 2.1.4.2 Clad Plate

ASTM A 263, with cladding conforming to ASTM A 240, UNS S40500 or S41008; or ASTM A 264, with cladding conforming to ASTM A 240, UNS S30400. Cladding shall be bonded on one side of base metal. Nominal thickness of the cladding shall be 10 percent of the nominal total plate thickness or 1/16 inch, whichever is greater. The thickness of the cladding shall not vary under the thickness specified by more than 2 percent of the nominal thickness of the clad plate. Plate finish shall be sandblasted, pickled, or, blast-cleaned and pickled. Stainless steel plate specified above in paragraph PLATE, SHEET, AND STRIP may be used in lieu of clad plate at the option of the Contractor.

## 2.1.4.3 Bars and Shapes

Stainless steel bars and shapes shall conform to the following as specified or shown:

- a. ASTM A 276, Type 304.
- b. ASTM A 564, UNS S17400 or S45000, age-hardened heat treatment condition, hot-finished or cold-finished, Class C.

## 2.1.4.4 Plates, Bars &amp; Shapes for Roller &amp; Track Systems

- a. Gate Rollers and Bolted Track Plates - ASTM A 564, UNS S17400 or S45000, age-hardened heat treated to obtain a Brinell hardness range of 331 minimum to 401 maximum, hot-finished or cold-finished, Class C. Heat treatment of rollers and plates shall not commence until the heat

treatment procedure and the test reports for other required material tests are approved. After heat treating and final machining, each roller and track plate shall be free of scale and cracks, as determined by magnetic particle, florescent, or dye penetrant inspection tests.

(1) Hardness Check Tests - Suitable 1/2 inch thick samples of the material from each heat shall be tested to determine the hardness in both the solution-annealed and age-hardened conditions. Where the oven-batch heat-treating process is used, hardness check tests shall be performed on material of each heat in each oven batch. Where a continuous heat-treating process is used, three check tests shall be performed on material of each heat: one on the first material through the process, one at the middle of the run, and one on the last material through the process.

b. Fasteners for Bolted Track Plates and Guide Bars - Bolting materials shall conform to ASTM A 193 or ASTM A 320, Class 2, Grade B8 Nuts shall conform to ASTM A 194, Grade 8A.

c. Gate Roller Links and Pins

(1) Links - ASTM A 276, Type 304.

(2) Pins - ASTM A 276, Type 304.

d. Seal Plates, Bars, and Retainers; Roller Guide Bars; and Track Plates.

(1) Welded Seal Plates and Bars; Welded Roller Guide Bars; and Welded Track Plates - ASTM A 240/A 240M, UNS S30400, Hot-Rolled and Annealed or Heat Treated, and Blast Cleaned or Pickled Finish; or ASTM A 276, UNS S30400, S40500, or S41000 with a maximum carbon content of 0.08 percent, Condition A, Hot-Finished or Cold-Finished, Class C.

(2) Bolted Seal Plates, Bars, and Retainers; and Bolted Roller Guide Bars - ASTM A 240/A 240M, UNS S40500, Hot-Rolled and Annealed or Heat Treated, and Blast Cleaned or Pickled finish; or ASTM A 276, UNS S30400, S40500, or S41000, Condition A, hot-finished or cold-finished, Class C.

#### 2.1.4.5 Pipe

ASTM A 312, seamless welded, UNS S30400, NPS and schedule number or outside diameter and nominal wall thickness as shown, plain threaded and coupled ends.

#### 2.1.5 Bolts, Nuts, and Washers

Bolts, nuts, and washers shall be of the material, grade, type, class, style and finish indicated or best suited for intended use.

##### 2.1.5.1 Bolts, Nuts, and Washers (Other Than High-Strength)

- a. Bolts and Nuts - ASTM A 307, Grade A, hot-dip galvanized or ASTM A 320.
- b. Bolts - ASME B18.2.1.
- c. Nuts - ASME B18.2.2.
- d. Washers
  - (1) Plain Washers - , Type B.
  - (2) Lock Washer - ASME B18.21.1.

#### 2.1.6 Screws

Screws shall be of the material, grade, type, style, and finish indicated or best suited for use intended.

##### 2.1.6.1 Cap Screws

ASME B18.2.1, ASME B18.3, or ASME B18.6.2 as required.

##### 2.1.6.2 Machine Screws

ASME B18.6.3.

##### 2.1.6.3 Set Screws

ASME B18.6.2.

#### 2.1.7 Wire Rope

Wire rope for the roller gate which shall conform to mil. spec. mil-w-8314-0w, type II, 3/8 inch diameter.

#### 2.1.8 Steel Casters

Steel casters for roller gate shall be heavy duty, rigid type, roller bearing with metal wheels and lubrication fitting with removable axle similar to the bassick co, casting no. 109.21-2CWP, or equal.

### 2.2 SHOP FABRICATED METAL ITEMS

Shop fabricated metal items shall conform to the requirements and details as specified or shown and to the workmanship provisions and other applicable fabrication requirements as specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

#### 2.2.1 Railings

Railings shall be of the type specified and shown and shall be furnished and installed complete with all fittings, brackets, fasteners, sleeves, anchors, and other appurtenances as shown and as required for proper

installation.

#### 2.2.1.1 Materials

Conforming to ASTM A53, TYPE S, GRADE A.

#### 2.2.1.2 Fabrication

Rigid joints in railings shall be of welded, threaded, or slip-on fittings assembly. Welded joints shall be reinforced with tight-fitting interior sleeves and shall be assembled by welding rails and posts to flush-type fittings, or by mitering and welding joining rails and posts. Assembled threaded joints shall have no exposed threads. Slip-on fittings shall be tight-fitting. Fasteners for slip-on fittings shall be the self-locking, concealed type. Fasteners for aluminum fittings shall be of aluminum or stainless steel. Fasteners for steel fittings shall be of stainless steel.

Expansion joints in railings shall be an inner-sleeved or outer-sleeved slip-joint, with one end of the sleeve secured to one rail and the ends of the adjoining rails separated a minimum of 1 inch in the installed position.

Expansion joints shall be located in rails near the intersection of rails and posts. Bends in railings shall be made in a manner that railings are not crushed and shall maintain their original cross-sectional shape. Welds shall be ground smooth. Railings shall be free of burrs, sharp corners, and sharp edges. For railings of other than welded assembly, manufacturer design calculations, showing that the installed railings are capable of withstanding a design working load of 200 pounds applied in any direction at any point on the top rail without permanent deformation, must be submitted and approved prior to installation.

#### 2.2.1.3 Installation

Railings shall be installed as specified and shown.

#### 2.2.2 Steel Stairs

Steel stairs shall be fabricated and installed as shown. All materials shall be galvanized after fabrication. Stringers, columns and other structural framing members shall be of structural steel shown. Stringers shall have exposed ends closed. Bolts, nuts and other fastenings shall be provided as shown and as required for proper installation. Lock washers shall be used under all nuts.

#### 2.2.3 Ladders

Ladders shall be fixed-rail metal ladders conforming to the requirements of EM 385-1-1 and to details shown. Ladders shall be fabricated of structural steel as shown and shall be galvanized after fabrication. Fabrication of ladders shall consist of solid-section rod rungs fitted into holes in bar side rails and welded. Splices in side rails shall be made using full penetration welds and shall provide a flush and smooth transition between connecting ends. All welds shall be ground smooth. Ladder rails shall be welded to bent-bar supporting brackets anchored to supporting structure as shown.



#### 2.2.4 Ladder Rung Grab Bars Pulling Irons Mooring Rings

Ladder rungs, grab bar, pulling irons, mooring rings shall be fabricated from steel rods in accordance with the details and shall be galvanized after fabrication.

#### PART 3 EXECUTION (Not Applicable)

-- End of Section --

## SECTION 16375A

ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND  
02/02

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C119.1	(1986; R 1997) Sealed Insulated Underground Connector Systems Rated 600 Volts
ANSI C135.30	(1988) Zinc-Coated Ferrous Ground Rods for Overhead or Underground Line Construction
ANSI C37.16	(2000) Low-Voltage Power Circuit Breakers and AC Power Circuit Protectors - Preferred Ratings, Related Requirements, and Application Recommendations
ANSI C37.46	(1981; R 1992) Power Fuses and Fuse Disconnecting Switches
ANSI C80.1	(1995) Rigid Steel Conduit - Zinc Coated
ANSI O5.1	(1992) Specifications and Dimensions for Wood Poles

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123/A 123M	(2001) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2001) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 48	(1994a1) Gray Iron Castings
ASTM A 48M	(1994e1) Gray Iron Castings (Metric)
ASTM B 117	(1997) Operating Salt Spray (Fog) Apparatus
ASTM B 3	(1995) Soft or Annealed Copper Wire
ASTM B 496	(1999) Compact Round

## Concentric-Lay-Stranded Copper Conductors

ASTM B 8	(1999) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM D 1654	(1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D 2472	(2000) Sulfur Hexafluoride

## FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM P7825a	(1998) Approval Guide Fire Protection
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## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(1997) National Electrical Safety Code
IEEE C37.1	(1994) IEEE Standard Definition, Specification, and Analysis of Systems Used for Supervisory Control, Data Acquisition, and Automatic Control
IEEE C37.13	(1990; R 1995) Low-Voltage AC Power Circuit Breakers Used in Enclosures
IEEE C37.2	(1996) Electrical Power System Device Function Numbers and Contact Designations
IEEE Std 100	(1997) IEEE Standard Dictionary of Electrical and Electronics Terms
IEEE Std 242	(1986; R 1991) Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
IEEE Std 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1) \F31.00\$\F

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA AB 1	(1993) Molded Case Circuit Breakers and Molded Case Switches
NEMA FB 1	(1993) Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
NEMA FU 1	(1986) Low Voltage Cartridge Fuses

NEMA TC 6	(1990) PVC and ABS Plastic Utilities Duct for Underground Installation
NEMA WC 7	(1988; Rev 3 1996) Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA WC 8	(1988; Rev 3 1996) Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)	
NFPA 70	(2002) National Electrical Code
UNDERWRITERS LABORATORIES (UL)	
UL 1242	(1996; Rev Mar 1998) Intermediate Metal Conduit
UL 1684	(2000) Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
UL 198C	(1986; Rev thru Feb 1998) High-Interrupting-Capacity Fuses, Current-Limiting Types
UL 198D	(1995) Class K Fuses
UL 198E	(1988; Rev Jul 1988) Class R Fuses
UL 198H	(1988; Rev thru Nov 1993) Class T Fuses
UL 467	(1993; Rev thru Apr 1999) Grounding and Bonding Equipment
UL 486A	(1997; Rev thru Dec 1998) Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 489	(1996; Rev thru Dec 1998) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 510	(1994; Rev thru Apr 1998) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
UL 514A	(1996; Rev Dec 1999) Metallic Outlet Boxes
UL 6	(1997) Rigid Metal Conduit

UL 651	(1995; Rev thru Oct 1998) Schedule 40 and 80 Rigid PVC Conduit
UL 854	(1996; Rev Oct 1999) Service-Entrance Cables

## 1.2 GENERAL REQUIREMENTS

### 1.2.1 Terminology

Terminology used in this specification is as defined in IEEE Std 100.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

#### Electrical Distribution System;G.

Detail drawings consisting of equipment drawings, illustrations, schedules, instructions, diagrams manufacturers standard installation drawings and other information necessary to define the installation and enable the Government to check conformity with the requirements of the contract drawings.

If departures from the contract drawings are deemed necessary by the Contractor, complete details of such departures shall be included with the detail drawings. Approved departures shall be made at no additional cost to the Government.

Detail drawings shall show how components are assembled, function together and how they will be installed on the project. Data and drawings for component parts of an item or system shall be coordinated and submitted as a unit. Data and drawings shall be coordinated and included in a single submission. Multiple submissions for the same equipment or system are not acceptable except where prior approval has been obtained from the Contracting Officer. In such cases, a list of data to be submitted later shall be included with the first submission. Detail drawings shall consist of the following:

a. Detail drawings showing physical arrangement, construction details, connections, finishes, materials used in fabrication, provisions for conduit or busway entrance, access requirements for installation and maintenance, physical size, electrical characteristics, foundation and support details, and equipment weight. Drawings shall be drawn to scale and/or dimensioned. All

optional items shall be clearly identified as included or excluded.

b. Internal wiring diagrams of equipment showing wiring as actually provided for this project. External wiring connections shall be clearly identified.

Detail drawings shall as a minimum depict the installation of the following items:

a. sluice gates electrical equipment.

#### As-Built Drawings;G.

The as-built drawings shall be a record of the construction as installed. The drawings shall include the information shown on the contract drawings as well as deviations, modifications, and changes from the contract drawings, however minor. The as-built drawings shall be a full sized set of prints marked to reflect deviations, modifications, and changes. The as-built drawings shall be complete and show the location, size, dimensions, part identification, and other information. Additional sheets may be added. The as-built drawings shall be jointly inspected for accuracy and completeness by the Contractor's quality control representative and by the Contracting Officer prior to the submission of each monthly pay estimate. Upon completion of the work, the Contractor shall provide three full sized sets of the marked prints to the Contracting Officer for approval. If upon review, the as-built drawings are found to contain errors and/or omissions, they will be returned to the Contractor for correction.

The Contractor shall correct and return the as-built drawings to the Contracting Officer for approval within 10 calendar days from the time the drawings are returned to the Contractor.

#### Nameplates.

Catalog cuts, brochures, circulars, specifications, product data, and printed information in sufficient detail and scope to verify compliance with the requirements of the contract documents.

#### Material and Equipment;G.

A complete itemized listing of equipment and materials proposed for incorporation into the work. Each entry shall include an item number, the quantity of items proposed, and the name of the manufacturer of each such item.

#### General Installation Requirements.

Procedures shall include cable pulling plans, diagrams, instructions, and precautions required to install, adjust, calibrate, and test the devices and equipment.

#### SD-06 Test Reports

#### Factory Tests.

Certified factory test reports shall be submitted when the manufacturer performs routine factory tests, including tests required by standards listed in paragraph REFERENCES. Results of factory tests performed shall be certified by the manufacturer, or an approved testing laboratory, and submitted within 7 days following successful completion of the tests. The manufacturer's pass-fail criteria for tests specified in paragraph FIELD TESTING shall be included.

#### Field Testing;G

A proposed field test plan, 20 days prior to testing the installed system. No field test shall be performed until the test plan is approved. The test plan shall consist of complete field test procedures including tests to be performed, test equipment required, and tolerance limits.

#### Operating Tests;G

Six copies of the information described below in 8-1/2 by 11 inch binders having a minimum of three rings, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

- a. A list of equipment used, with calibration certifications.
- b. A copy of measurements taken.
- c. The dates of testing.
- d. The equipment and values to be verified.
- e. The condition specified for the test.
- f. The test results, signed and dated.
- g. A description of adjustments made.

#### Cable Installation;G

Six copies of the information described below in 8-1/2 by 11 inch binders having a minimum of three rings from which material may readily be removed and replaced, including a separate section for each cable pull. Sections shall be separated by heavy plastic dividers with tabs, with all data sheets signed and dated by the person supervising the pull.

- a. Site layout drawing with cable pulls numerically identified.
- b. A list of equipment used, with calibration certifications. The manufacturer and quantity of lubricant used on pull.

- c. The cable manufacturer and type of cable.
- d. The dates of cable pulls, time of day, and ambient temperature.
- e. The length of cable pull and calculated cable pulling tensions.
- f. The actual cable pulling tensions encountered during pull.

#### SD-07 Certificates

##### Material and Equipment.

Where materials or equipment are specified to conform to the standards of the Underwriters Laboratories (UL) or to be constructed or tested, or both, in accordance with the standards of the American National Standards Institute (ANSI), the Institute of Electrical and Electronics Engineers (IEEE), or the National Electrical Manufacturers Association (NEMA), the Contractor shall submit proof that the items provided conform to such requirements.

The label of, or listing by, UL will be acceptable as evidence that the items conform. Either a certification or a published catalog specification data statement, to the effect that the item is in accordance with the referenced ANSI or IEEE standard, will be acceptable as evidence that the item conforms. A similar certification or published catalog specification data statement to the effect that the item is in accordance with the referenced NEMA standard, by a company listed as a member company of NEMA, will be acceptable as evidence that the item conforms. In lieu of such certification or published data, the Contractor may submit a certificate from a recognized testing agency equipped and competent to perform such services, stating that the items have been tested and that they conform to the requirements listed, including methods of testing of the specified agencies. Compliance with above-named requirements does not relieve the Contractor from compliance with any other requirements of the specifications.

##### Cable Installer Qualifications.

The Contractor shall provide at least one onsite person in a supervisory position with a documentable level of competency and experience to supervise all cable pulling operations. A resume shall be provided showing the cable installers' experience in the last three years, including a list of references complete with points of contact, addresses and telephone numbers.

#### SD-10 Operation and Maintenance Data

##### Electrical Distribution System.

Six copies of operation and maintenance manuals, within 7 calendar days following the completion of tests and including



assembly, installation, operation and maintenance instructions, spare parts data which provides supplier name, current cost, catalog order number, and a recommended list of spare parts to be stocked. Manuals shall also include data outlining detailed procedures for system startup and operation, and a troubleshooting guide which lists possible operational problems and corrective action to be taken. A brief description of all equipment, basic operating features, and routine maintenance requirements shall also be included. Documents shall be bound in a binder marked or identified on the spine and front cover. A table of contents page shall be included and marked with pertinent contract information and contents of the manual. Tabs shall be provided to separate different types of documents, such as catalog ordering information, drawings, instructions, and spare parts data. Index sheets shall be provided for each section of the manual when warranted by the quantity of documents included under separate tabs or dividers.

Three additional copies of the instructions manual shall be provided within 30 calendar days following the manuals.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

Devices and equipment shall be visually inspected by the Contractor when received and prior to acceptance from conveyance. Stored items shall be protected from the environment in accordance with the manufacturer's published instructions. Damaged items shall be replaced. Oil filled transformers and switches shall be stored in accordance with the manufacturer's requirements. Wood poles held in storage for more than 2 weeks shall be stored in accordance with ANSI O5.1. Handling of wood poles shall be in accordance with ANSI O5.1, except that pointed tools capable of producing indentations more than 1 inch in depth shall not be used. Metal poles shall be handled and stored in accordance with the manufacturer's instructions.

#### 1.5 EXTRA MATERIALS

One additional spare fuse or fuse element for each furnished fuse or fuse element shall be delivered to the contracting officer when the electrical system is accepted. Two complete sets of all special tools required for maintenance shall be provided, complete with a suitable tool box. Special tools are those that only the manufacturer provides, for special purposes (to access compartments, or operate, adjust, or maintain special parts).

### PART 2 PRODUCTS

#### 2.1 STANDARD PRODUCT

Material and equipment shall be the standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

## 2.2 NAMEPLATES

### 2.2.1 General

Each major component of this specification shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a nameplate securely attached to the equipment. Nameplates shall be made of noncorrosive metal. Equipment containing liquid dielectrics shall have the type of dielectric on the nameplate. Sectionalizer switch nameplates shall have a schematic with all switch positions shown and labeled. As a minimum, nameplates shall be provided for transformers, circuit breakers, meters, switches, and switchgear.

## 2.3 CORROSION PROTECTION

### 2.3.1 Aluminum Materials

Aluminum shall not be used.

### 2.3.2 Ferrous Metal Materials

#### 2.3.2.1 Hardware

Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A 153/A 153M and ASTM A 123/A 123M.

#### 2.3.2.2 Equipment

Equipment and component items, including but not limited to transformer stations and ferrous metal luminaries not hot-dip galvanized or porcelain enamel finished, shall be provided with corrosion-resistant finishes which shall withstand 120 hours of exposure to the salt spray test specified in ASTM B 117 without loss of paint or release of adhesion of the paint primer coat to the metal surface in excess of 1/16 inch from the test mark. The scribed test mark and test evaluation shall be in accordance with ASTM D 1654 with a rating of not less than 7 in accordance with TABLE 1, (procedure A). Cut edges or otherwise damaged surfaces of hot-dip galvanized sheet steel or mill galvanized sheet steel shall be coated with a zinc rich paint conforming to the manufacturer's standard.

### 2.3.3 Finishing

Painting required for surfaces not otherwise specified and finish painting of items only primed at the factory shall be as specified in Section 09900 PAINTS AND COATINGS.

## 2.4 CABLES

Cables shall be single conductor type unless otherwise indicated.

### 2.4.1 Low-Voltage Cables

#### 2.4.2 LOW VOLTAGE CABLE

Cables shall be rated 600 volts and shall conform to the requirements of NFPA 70, and must be UL listed for the application or meet the applicable section of either ICEA or NEMA standards.

##### 2.4.2.1 Conductor Material

Underground cables shall be annealed copper complying with ASTM B 3 and ASTM B 8. Intermixing of copper and aluminum conductors is not permitted.

##### 2.4.2.2 Insulation2.4.2.2 Insulation

Insulation must be in accordance with NFPA 70, and must be UL listed for the application or meet the applicable sections of either ICEA, or NEMA standards.

##### 2.4.2.3 Multiconductor Cables

Multiconductor cables shall have an overall PVC outer jacket.

##### 2.4.2.4 In Duct

Cables shall be single-conductor cable, in accordance with NFPA 70.

#### 2.5 CABLE JOINTS, TERMINATIONS, AND CONNECTORS

##### 2.5.1 Low-Voltage Cable Splices

Low-voltage cable splices and terminations shall be rated at not less than 600 Volts. Splices in conductors No. 10 AWG and smaller shall be made with an insulated, solderless, pressure type connector, conforming to the applicable requirements of UL 486A. Splices in conductors No. 8 AWG and larger shall be made with noninsulated, solderless, pressure type connector, conforming to the applicable requirements of UL 486A and UL 486B.

Splices shall then be covered with an insulation and jacket material equivalent to the conductor insulation and jacket. Splices below grade or in wet locations shall be sealed type conforming to ANSI C119.1 or shall be waterproofed by a sealant-filled, thick wall, heat shrinkable, thermosetting tubing or by pouring a thermosetting resin into a mold that surrounds the joined conductors.

##### 2.5.2 Terminations

Terminations shall be in accordance with IEEE Std 48, Class 1 or Class 2; of the molded elastomer, wet-process porcelain, prestretched elastomer, heat-shrinkable elastomer, or taped type. Acceptable elastomers are track-resistant silicone rubber or track-resistant ethylene propylene

compounds, such as ethylene propylene rubber or ethylene propylene diene monomer. Separable insulated connectors may be used for apparatus terminations, when such apparatus is provided with suitable bushings. Terminations shall be of the outdoor type, except that where installed inside outdoor equipment housings which are sealed against normal infiltration of moisture and outside air, indoor, Class 2 terminations are acceptable. Class 3 terminations are not acceptable. Terminations, where required, shall be provided with mounting brackets suitable for the intended installation and with grounding provisions for the cable shielding, metallic sheath, and armor.

#### 2.5.2.1 Factory Preformed Type

Molded elastomer, wet-process porcelain, prestretched, and heat-shrinkable terminations shall utilize factory preformed components to the maximum extent practicable rather than tape build-up. Terminations shall have basic impulse levels as required for the system voltage level. Leakage distances shall comply with wet withstand voltage test requirements of IEEE Std 48 for the next higher Basic Insulation Level (BIL) level. Anti-tracking tape shall be applied over exposed insulation of preformed molded elastomer terminations.

#### 2.5.2.2 Taped Terminations

Taped terminations shall use standard termination kits providing terminal connectors, field-fabricated stress cones, and rain hoods. Terminations shall be at least 20 inches long from the end of the tapered cable jacket to the start of the terminal connector, or not less than the kit manufacturer's recommendations, whichever is greater.

### 2.6 CONDUIT AND DUCTS

Ducts shall be single, round-bore type, with wall thickness and fittings suitable for the application.

#### 2.6.1 Metallic Conduit

Intermediate metal conduit shall comply with UL 1242. Rigid galvanized steel conduit shall comply with UL 6 and ANSI C80.1. Metallic conduit fittings and outlets shall comply with UL 514A and NEMA FB 1.

#### 2.6.2 Nonmetallic Ducts

##### 2.6.2.1 Not used.

##### 2.6.2.2 Concrete Encased Ducts

UL 651 Schedule 40 or NEMA TC 6 Type EB.

##### 2.6.2.3 Direct Burial

UL 651 Schedule 40 and Schedule 80, or NEMA TC 6 Type DB.

#### 2.6.3 Conduit Sealing Compound

Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F, shall neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compounds shall adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, masonry, or lead; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials.

## 2.7 MANHOLES, HANDHOLES, AND PULLBOXES

Manholes, handholes, and pullboxes shall be as indicated. Strength of manholes, handholes, and pullboxes and their frames and covers shall conform to the requirements of IEEE C2. Precast-concrete manholes shall have the required strength established by ASTM C 478, ASTM C 478M. Frames and covers shall be made of gray cast iron and a machine-finished seat shall be provided to ensure a matching joint between frame and cover. Cast iron shall comply with ASTM A 48, Class 30B, minimum. Handholes for low voltage cables installed in parking lots, sidewalks, and turfed areas shall be fabricated from an aggregate consisting of sand and with continuous woven glass strands having an overall compressive strength of at least 10,000 psi and a flexural strength of at least 5,000 psi. Pullbox and handhole covers in sidewalks, and turfed areas shall be of the same material as the box. Concrete pullboxes shall consist of precast reinforced concrete boxes, extensions, bases, and covers.

## 2.8 POLES AND HARDWARE

Poles and hardware shall be per PSE&G requirements.

## 2.9 Not used.

## 2.10 METERING AND PROTECTIVE DEVICES

### 2.10.1 Fuses, Low-Voltage, Including Current-Limiting

Low-voltage fuses shall conform to NEMA FU 1. Equipment provided under this contract shall be provided with a complete set of properly rated fuses when the equipment manufacturer utilizes fuses in the manufacture of the equipment, or if current-limiting fuses are required to be installed to limit the ampere-interrupting capacity of circuit breakers or equipment to less than the maximum available fault current at the location of the equipment to be installed. Fuses shall have a voltage rating of not less than the phase-to-phase circuit voltage, and shall have the time-current characteristics required for effective power system coordination.

## 2.11 SURGE ARRESTERS

Surge arresters shall comply with NEMA LA 1, IEEE C62.1, IEEE C62.2, and IEEE C62.11 and shall be provided where indicated. Arresters shall be distribution class, rated as shown. Arresters for use at elevations in excess of 6000 feet above mean sea level shall be specifically rated for

that purpose. Arresters shall be equipped with mounting brackets suitable for the indicated installations. Arresters shall be of the combination valve-metal-oxide varistor type.

## 2.12 GROUNDING AND BONDING

### 2.12.1 Driven Ground Rods

Ground rods shall be copper-clad steel conforming to UL 467 not less than 5/8 inch in diameter by 10 feet in length. Sectional type rods may be used.

### 2.12.2 Grounding Conductors

Grounding conductors shall be bare, except where installed in conduit with associated phase conductors. Insulated conductors shall be of the same material as phase conductors and green color-coded, except that conductors shall be rated no more than 600 volts. Bare conductors shall be ASTM B 8 soft-drawn unless otherwise indicated. Aluminum is not acceptable.

## 2.13 CONCRETE AND REINFORCEMENT

Concrete work shall have minimum 3000 psi compressive strength and conform to the requirements of Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Concrete reinforcing shall be as specified in Section 03200A CONCRETE REINFORCEMENT.

### 2.14 Not used.

## 2.15 CABLE FIREPROOFING SYSTEMS

Cable fireproofing systems shall be listed in FM P7825a as a fire-protective coating or tape approved for grouped electrical conductors and shall be suitable for application on the type of medium-voltage cables provided. After being fully cured, materials shall be suitable for use where exposed to oil, water, gases, salt water, sewage, and fungus and shall not damage cable jackets or insulation. Asbestos materials are not acceptable.

### 2.15.1 Fireproof Coating

Cable fireproofing coatings shall be compounded of water-based thermoplastic resins, flame-retardant chemicals, and inorganic noncombustible fibers and shall be suitable for the application methods used. Coatings applied on bundled cables shall have a derating factor of less than 5 percent, and a dielectric strength of 95 volts per mil minimum after curing.

### 2.15.2 Fireproofing Tape

Fireproofing tape shall be at least 2 inches wide and shall be a flexible, conformable, polymeric, elastomer tape designed specifically for fireproofing cables.

### 2.15.3 Plastic Tape

Preapplication plastic tape shall be pressure sensitive, 10 mil thick, conforming to UL 510.

2.16 Not used

#### 2.17 FACTORY TESTS

Factory tests shall be performed, as follows, in accordance with the applicable publications and with other requirements of these specifications. The Contracting Officer shall be notified at least 10 days before the equipment is ready for testing. The Contracting Officer reserves the right to witness the tests.

a. sluice gate motor and control assembly.

2.18 Not used.

### PART 3 EXECUTION

#### 3.1 GENERAL INSTALLATION REQUIREMENTS

Equipment and devices shall be installed and energized in accordance with the manufacturer's published instructions. Except as covered herein, excavation, trenching, and backfilling shall conform to the requirements of Section 02316A EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Concrete work shall have minimum 3000 psi compressive strength and conform to the requirements of Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

##### 3.1.1 Conformance to Codes

The installation shall comply with the requirements and recommendations of NFPA 70 and IEEE C2 as applicable.

##### 3.1.2 Verification of Dimensions

The Contractor shall become familiar with details of the work, shall verify dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing any work.

#### 3.2 CABLE AND BUSWAY INSTALLATION

The Contractor shall obtain from the manufacturer an installation manual or set of instructions which addresses such aspects as cable construction, insulation type, cable diameter, bending radius, cable temperature, lubricants, coefficient of friction, conduit cleaning, storage procedures, moisture seals, testing for and purging moisture, etc. The Contractor shall then prepare a checklist of significant requirements which shall be submitted along with the manufacturers instructions in accordance with SUBMITTALS.

##### 3.2.1 Cable Installation Plan and Procedure

Cable shall be installed strictly in accordance with the cable manufacturer's recommendations. Each circuit shall be identified by means of a fiber, laminated plastic, or non-ferrous metal tags, or approved equal, in each manhole, handhole, junction box, and each terminal. Each tag shall contain the following information; cable type, conductor size, circuit number, circuit voltage, cable destination and phase identification.

#### 3.2.1.1 Cable Inspection

The cable reel shall be inspected for correct storage positions, signs of physical damage, and broken end seals. If end seal is broken, moisture shall be removed from cable in accordance with the cable manufacturer's recommendations.

#### 3.2.1.2 Duct Cleaning

Duct shall be cleaned with an assembly that consists of a flexible mandrel (manufacturers standard product in lengths recommended for the specific size and type of duct) that is 1/4 inch less than inside diameter of duct, 2 wire brushes, and a rag. The cleaning assembly shall be pulled through conduit a minimum of 2 times or until less than a volume of 8 cubic inches of debris is expelled from the duct.

#### 3.2.1.3 Duct Lubrication

The cable lubricant shall be compatible with the cable jacket for cable that is being installed. Application of lubricant shall be in accordance with lubricant manufacturer's recommendations.

#### 3.2.1.4 Cable Installation

The Contractor shall provide a cable feeding truck and a cable pulling winch as required. The Contractor shall provide a pulling grip or pulling eye in accordance with cable manufacturer's recommendations. The pulling grip or pulling eye apparatus shall be attached to polypropylene or manilla rope followed by lubricant front end packs and then by power cables. A dynamometer shall be used to monitor pulling tension. Pulling tension shall not exceed cable manufacturer's recommendations. The Contractor shall not allow cables to cross over while cables are being fed into duct. For cable installation in cold weather, cables shall be kept at 50 degrees F temperature for at least 24 hours before installation.

#### 3.2.1.5 Cable Installation Plan

The Contractor shall submit a cable installation plan for all cable pulls in accordance with the detail drawings portion of paragraph SUBMITTALS. Cable installation plan shall include:

- a. Site layout drawing with cable pulls identified in numeric order of expected pulling sequence and direction of cable pull.
- b. List of cable installation equipment.
- c. Lubricant manufacturer's application instructions.



- d. Procedure for resealing cable ends to prevent moisture from entering cable.
- e. Cable pulling tension calculations of all cable pulls.
- f. Cable percentage conduit fill.
- g. Cable sidewall thrust pressure.
- h. Cable minimum bend radius and minimum diameter of pulling wheels used.
- i. Cable jam ratio.
- j. Maximum allowable pulling tension on each different type and size of conductor.
- k. Maximum allowable pulling tension on pulling device.

#### 3.2.2 Duct Line

Cables shall be installed in duct lines where indicated. Cable splices in low-voltage cables shall be made in manholes and handholes only, except as otherwise noted. Neutral and grounding conductors shall be installed in the same duct with their associated phase conductors.

#### 3.3 Not used

#### 3.4 Not used

### 3.3 DUCT LINES

#### 3.3.1 Requirements

Numbers and sizes of ducts shall be as indicated. Duct lines shall be laid with a minimum slope of 4 inches per 100 feet. Depending on the contour of the finished grade, the high-point may be at a terminal, a manhole, a handhole, or between manholes or handholes. Short-radius manufactured 90-degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius shall be 18 inches for ducts of less than 3 inch diameter, and 36 inches for ducts 3 inches or greater in diameter. Otherwise, long sweep bends having a minimum radius of 25 feet shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used. Ducts shall be provided with end bells whenever duct lines terminate in manholes or handholes.

#### 3.3.2 Treatment

Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools

and match factory tapers. A coupling recommended by the duct manufacturer shall be used whenever an existing duct is connected to a duct of different material or shape. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts shall be thoroughly cleaned before being laid. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

#### 3.3.3 Concrete Encasement

Ducts requiring concrete encasements shall comply with NFPA 70, except that electrical duct bank configurations for ducts 6 inches in diameter shall be determined by calculation and as shown on the drawings. The separation between adjacent electric power and communication ducts shall conform to IEEE C2. Duct line encasements shall be monolithic construction. Where a connection is made to a previously poured encasement, the new encasement shall be well bonded or doweled to the existing encasement. The Contractor shall submit proposed bonding method for approval in accordance with the detail drawing portion of paragraph SUBMITTALS. At any point, except railroad and airfield crossings, tops of concrete encasements shall be not less than the cover requirements listed in NFPA 70. At railroad and airfield crossings, duct lines shall be encased with concrete and reinforced as indicated to withstand specified surface loadings. Tops of concrete encasements shall be not less than 5 feet below tops of rails or airfield paving unless otherwise indicated. Where ducts are jacked under existing pavement, rigid steel conduit will be installed because of its strength. To protect the corrosion-resistant conduit coating, predrilling or installing conduit inside a larger iron pipe sleeve (jack-and-sleeve) is required. For crossings of existing railroads and airfield pavements greater than 50 feet in length, the predrilling method or the jack-and-sleeve method will be used. Separators or spacing blocks shall be made of steel, concrete, plastic, or a combination of these materials placed not farther apart than 4 feet on centers. Ducts shall be securely anchored to prevent movement during the placement of concrete and joints shall be staggered at least 6 inches vertically.

#### 3.3.4 Nonencased Direct-Burial

Top of duct lines shall be not less than inches below finished grade and shall be installed with a minimum of 3 inches of earth around each duct, except that between adjacent electric power and communication ducts, 12 inches of earth is required. Bottoms of trenches shall be graded toward manholes or handholes and shall be smooth and free of stones, soft spots, and sharp objects. Where bottoms of trenches comprise materials other than sand, a 3 inch layer of sand shall be laid first and compacted to approximate densities of surrounding firm soil before installing ducts. Joints in adjacent tiers of duct shall be vertically staggered at least 6 inches. The first 6 inch layer of backfill cover shall be sand compacted as previously specified. The rest of the excavation shall be backfilled and compacted in 6 inch layers. Duct banks may be held in alignment with earth. However, high-tiered banks shall use a wooden frame or equivalent form to hold ducts in alignment prior to backfilling.

#### 3.3.5 Installation of Couplings

Joints in each type of duct shall be made up in accordance with the manufacturer's recommendations for the particular type of duct and coupling selected and as approved.

### 3.3.6 Duct Line Markers

Duct line markers shall be provided at the ends of long duct line stubouts or for other ducts whose locations are indeterminate because of duct curvature or terminations at completely below-grade structures. In addition to markers, a 5 mil brightly colored plastic tape, not less than 3 inches in width and suitably inscribed at not more than 10 feet on centers with a continuous metallic backing and a corrosion-resistant 1 mil metallic foil core to permit easy location of the duct line, shall be placed approximately 12 inches below finished grade levels of such lines.

### 3.4 PADLOCKS.

Padlocks shall be provided for each outdoor equipment enclosure. Padlocks shall be keyed alike.

### 3.5 CONNECTIONS BETWEEN AERIAL AND UNDERGROUND SYSTEMS

Connections between aerial and underground systems shall be made as required. Underground cables shall be extended up poles in conduit to cable terminations. Conduits shall be secured to the poles by 2-hole galvanized steel pipe straps spaced not more than 10 feet apart and with 1 strap not more than 12 inches from any bend or termination. Cable guards shall be secured to poles in accordance with the manufacturer's published procedures. Conduits shall be equipped with bushings to protect cables and minimize water entry. Cables shall be supported by devices separate from the conduit or guard, near their point of exit from the conduit or guard.

### 3.6 GROUNDING

A ground consisting of the indicated configuration of bare copper conductors and driven ground rods shall be installed next to equipment as shown. Equipment frames of metal-enclosed equipment, and other noncurrent-carrying metal parts, such as cable shields, cable sheaths and armor, and metallic conduit shall be grounded.

#### 3.6.1 Grounding Electrodes

Grounding electrodes shall be installed as shown on the drawings and as follows:

- a. Driven rod electrodes - Unless otherwise indicated, ground rods shall be driven into the earth until the tops of the rods are approximately 1 foot below finished grade.
- b. Additional electrodes - When the required ground resistance is not met, additional electrodes shall be provided interconnected with grounding conductors to achieve the specified ground resistance. The additional electrodes will be 10 foot rods spaced a minimum of

10 feet apart, 5/8 inch diameter, driven perpendicular to grade. In high ground resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately.

#### 3.6.2 Grounding and Bonding Connections

Connections above grade shall be made by the fusion-welding process or with bolted solderless connectors, in compliance with UL 467, and those below grade shall be made by a fusion-welding process. Where grounding conductors are connected to aluminum-composition conductors, specially treated or lined copper-to-aluminum connectors suitable for this purpose shall be used.

#### 3.6.3 Grounding and Bonding Conductors

Grounding and bonding conductors include conductors used to bond transformer enclosures and equipment frames to the grounding electrode system. Bends greater than 45 degrees in ground conductors are not permitted. Routing of ground conductors through concrete shall be avoided.

#### 3.6.4 Riser Pole Grounding

A single continuous vertical grounding electrode conductor shall be installed on each riser pole and connected directly to the grounding electrodes indicated on the drawings or required by these specifications. All equipment, neutrals, surge arresters, and items required to be grounded shall be connected directly to this vertical conductor. The grounding electrode conductor shall be sized as shown. Grounding electrode conductors shall be stapled to wood poles at intervals not exceeding 2 feet.

### 3.7 FIELD TESTING

#### 3.7.1 General

Field testing shall be performed in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer 10 days prior to conducting tests. The Contractor shall furnish all materials, labor, and equipment necessary to conduct field tests. The Contractor shall perform all tests and inspections recommended by the manufacturer unless specifically waived by the Contracting Officer. The Contractor shall maintain a written record of all tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. Field test reports shall be signed and dated by the Contractor.

#### 3.7.2 Safety

The Contractor shall provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the

test vicinity. The Contractor shall replace any devices or equipment which are damaged due to improper test procedures or handling.

### 3.7.3 Ground-Resistance Tests

The resistance of each grounding electrode system shall be measured using the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

- a. Single rod electrode - 25 ohms.
- b. Multiple rod electrodes - 25 ohms.

### 3.7.4 Low-Voltage Cable Test

Low-voltage cable, complete with splices, shall be tested for insulation resistance after the cables are installed, in their final configuration, ready for connection to the equipment, and prior to energization. The test voltage shall be 500 volts dc, applied for one minute between each conductor and ground and between all possible combinations conductors in the same trench, duct, or cable, with all other conductors in the same trench, duct, or conduit. The minimum value of insulation shall be:

$$R \text{ in megohms} = (\text{rated voltage in kV} + 1) \times 1000 / (\text{length of cable in feet})$$

Each cable failing this test shall be repaired or replaced. The repaired cable shall be retested until failures have been eliminated.

### 3.7.5 Pre-Energization Services

Calibration, testing, adjustment, and placing into service of the installation shall be accomplished by a manufacturer's product field service engineer or independent testing company with a minimum of 2 years of current product experience. The following services shall be performed on the equipment listed below. These services shall be performed subsequent to testing but prior to the initial energization. The equipment shall be inspected to ensure that installation is in compliance with the recommendations of the manufacturer and as shown on the detail drawings. Terminations of conductors at major equipment shall be inspected to ensure the adequacy of connections. Bare and insulated conductors between such terminations shall be inspected to detect possible damage during installation. If factory tests were not performed on completed assemblies, tests shall be performed after the installation of completed assemblies. Components shall be inspected for damage caused during installation or shipment to ensure packaging materials have been removed. Components capable of being both manually and electrically operated shall be operated

manually prior to the first electrical operation. Components capable of being calibrated, adjusted, and tested shall be calibrated, adjusted, and tested in accordance with the instructions of the equipment manufacturer. Items for which such services shall be provided, but are not limited to, are the following:

- a. Sluice gates actuators.

#### 3.7.6 Operating Tests

After the installation is completed, and at such times as the Contracting Officer may direct, the Contractor shall conduct operating tests for approval. The equipment shall be demonstrated to operate in accordance with the requirements herein. An operating test report shall be submitted in accordance with paragraph SUBMITTALS.

### 3.8 MANUFACTURER'S FIELD SERVICE

#### 3.8.1 Onsite Training

The Contractor shall conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist of a total of 6 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance tests. The course instruction shall cover pertinent points involved in operating, starting, stopping, and servicing the equipment, as well as all major elements of the operation and maintenance manuals. Additionally, the course instructions shall demonstrate all routine maintenance operations.

#### 3.8.2 Installation Engineer

After delivery of the equipment, the Contractor shall furnish one or more field engineers, regularly employed by the equipment manufacturer to supervise the installation of the equipment, assist in the performance of the onsite tests, initial operation, and instruct personnel as to the operational and maintenance features of the equipment.

### 3.9 ACCEPTANCE

Final acceptance of the facility will not be given until the Contractor has successfully completed all tests and after all defects in installation, material or operation have been corrected.

-- End of Section --